SCIENCE

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THE CHICAGO MEETING

THE meeting of the American Association for the Advancement of Science and its affiliated national scientific societies, to be held in Chicago during the convocation week that begins on Monday next, will be an event of consequence for the history of science in America. It will be by far larger and more important than any previous gathering of scientific men west of the Atlantic seaboard. Since the establishment of convocation week and the affiliation of the scientific societies, there have been three large meetings, those of Washington five years ago, of Philadelphia three years ago and of New York a year ago. At each of these meetings the attendance exceeded 1,500, and the proceedings represented a considerable part of the scientific work accomplished during the year. In the Christmas holidays of 1901—the year before the first of the convocation-week meetings—the American Society of Naturalists met at Chicago, and this meeting was the largest in its history. It was surprising as well as gratifying to note the large number of active scientific workers from Illinois and the neighboring states, as well as the number willing to make the trip from the Atlantic states and even from the Pacific seaboard.

It is now nearly forty years since the American Association last met in Chicago.

At the meeting which opened on August 5, 1868, there were 259 members in attendance. The immediately preceding meetings at Burlington and Buffalo had, respectively, an attendance of only 73 and 79 members. At the time of the Chicago meeting the membership of the association increased from 415 to 686. The retiring president was Professor J. S. Newberry, the eminent geologist of Columbia University, and the president of the meeting was Professor B. A. Gould, the eminent astronomer of Harvard University.

The forty years that have elapsed since the Chicago meeting of the association have witnessed a growth of scientific and educational institutions and an increase in the number of scientific workers unparalleled elsewhere or hitherto. Cornell University was established in the year of the Chicago meeting; one year later the new administration of Harvard University under Dr. Eliot was inaugurated; the Johns Hopkins University opened its doors in 1876. Since then our universities have become great centers for research as well as for instruction. Parallel with them have been established museums and institutions devoted wholly to investigation; while the national government and the states have undertaken work in economic and pure science to an extent that none could have anticipated a few years ago.

The state of Illinois and the city of Chicago, beginning later, have witnessed a rapid development of their scientific institutions, scarcely rivaled by any other state or city. Nowhere else will there be found a state university and an incorporated university which have enjoyed a growth so great as that of the University of Illinois and the University of Chicago. Twelve years ago there were 500 students in the University of Illinois; there are now 4,000 students and 500 teachers. The University of Chicago, which has received gifts amounting to $27,000,000, was opened only sixteen years ago. Northwestern University and other institutions of the state have developed in nearly equal measure.

Our societies have aimed to adjust themselves to this scientific activity, ever increasing in range and complexity, and have on the whole succeeded. In 1875 the American Association was divided into two sections, one for the exact sciences and one for the physical sciences. In 1882 nine sections were established corresponding in general to the present organization, except that a section of physiology and experimental medicine was added five years ago, and a section of education will hold its first meeting next week at Chicago. The American Chemical Society was organized in 1876; the American Society of Naturalists in 1883, the Geological Society of America and the present American Mathematical Society in 1888, and there are now national societies for nearly every science. The interrelations of these societies offered many perplexing problems, and it can not be claimed that they are all solved. But it is undoubtedly true that progress has been made, and that the general spirit of cooperation among scientific men is better than ever before.

The natural group is those living in the same locality and having common interests. Such a group may unite with others in the same neighborhood to form an academy

and with others following the same science to form a national society. The members of the local academies and national societies, in so far as they have common interests, would unite in a national association for the advancement of science. Among the questions open are the size of the local group—whether it should be limited to a city or include a state or have some other basis—whether it should be limited to the natural and exact sciences or should include other groups, as the historical and linguistic sciences or medicine and engineering. In the case of the special societies there is a tacit agreement to make them national or rather continental, but there is a tendency to hold sectional meetings. Thus this year the zoologists are meeting both in Chicago and in New Haven, and the mathematicians are meeting both in Chicago and in New York. It seems certain that the national societies will be maintained for purposes of publication, and it seems probable that they will continue to hold general meetings.

The American Medical Association has an organization devised with great care. There are county societies, which unite in state societies and these form a national association. The national association conducts an admirable weekly journal and holds annual migrating meetings. There is a house of delegates for legislative purposes having strong standing committees. The teachers of the country, who, like the physicians, are subject to county regulations and state laws, are organized along similar lines, but less effectively. The chemists, who include those engaged in professional work as well as those devoted to pure science, have an excellent monthly journal and regional sections with two annual migrating meetings, one of which is held in affiliation with the American Association. Each of the natural and exact sciences has now its organization, and in some cases the society has regional sections. Thus the American Mathematical Society holds meetings in the eastern, central and western states and the American Society of Zoologists in the eastern and central states. There are also local societies for special sciences, which are not as yet affiliated with the national organizations.

We surely need a general association to represent the united scientific interests of the country, but the relations that should subsist between it and the special national societies and the local and state academies are not entirely clear. The American Association may become an affiliation of scientific societies rather than of individuals, its work being done by a council or senate representing the separate societies. It may hold meetings that are national or sectional or both. It may include only the natural and exact sciences, being coordinate with the associations for philology, history, medicine, engineering, education, etc., or it may aim to represent all the scientific interests of the country.

Under existing conditions of our civilization cooperation and organization are required, and there are at least four reasons, which make them essential in science. The first of these is that science is by its nature cooperative; men of science must work together for a common end. The second is the vast importance of science for the stability and progress of society. The third

is that scientific work is not economically self-supporting. Scientific men are not paid directly for the research work they do, and means must be found by which scientific work shall be supported. The fourth is closely connected with this—the need to keep science in touch with the general public, whence it must obtain its recruits and its support.

We can not therefore doubt that a national association for the advancement of science will be maintained, and that it will grow in importance and influence. It is the part of each scientific man to support the existing organization, to exercise patience when the complexity of the immediate situation does not admit of easy solution, and to do his share toward improving the conditions. Not only all scientific men, but also all those who wish well to science, should appreciate the privilege of membership in the American Association and the desirability of attending the approaching meeting at Chicago.

HISTORY OF THE FORMER STATE NATURAL HISTORY SOCIETIES OF ILLINOIS[1]

The history of scientific organization is a part, merely, of the history of scientific progress, and that is a part of the history of the progress of civilization, and especially of education; and the subject which I am to present is no exception to this rule. It is difficult to omit from even a brief abstract of the history of the Illinois natural history societies all reference to the character and status of the general movements of which they were scarcely more than by-products, and still to leave in the account enough significance to make it worthy of presentation here. Under these circumstances I shall be governed by the reflection that we are to-day looking forward and not back—that we are preparing for the future and not studying the past—and that we are hence practically interested in what has come and gone only as it may help us to bring a new thing into being in a way to secure its permanent continuance and its normal growth. There have been two state natural history societies in Illinois, one founded in 1858 and the other in 1874. The first was the result of a proposal by an entomologist, Dr. Cyrus Thomas, afterwards state entomologist of Illinois, made at a meeting of the State Teachers' Association at Bloomington in 1857. The second sprang up as a sequel to the sessions of a summer school of natural science held at the State Normal School, at Normal, and had for its first president the state geologist, A. H. Worthen, and for its first secretary the present writer, then in charge of the museum of the old society in the State Normal building.

The first society was chartered by the state legislature in 1861; held its tenth and last annual meeting in 1868; published, in 1861, Volume I., series 1, of its *Transactions* (in Volume IV. of the *Transactions* of the State Agricultural Society, and again, in a second edition, in 1862, as a separate pamphlet, a rare copy of which I hold in my hand); formed a museum of natural history which was housed in the building of the State Normal School at Normal; and held two final business meetings in Bloomington, May 26 and June 22, 1871, for the transfer of its museum to the state in accordance with a provision of law passed by the general assembly of that year. This museum, held by the State Board of Education "for the use and benefit of the state," was gradually transformed, in due time, into the present State

[1] An address given on the occasion of a meeting called to establish the Illinois Academy of Sciences.

Laboratory of Natural History. A part of its original material is now in the possession of that institution at Urbana, a part of it belongs to the State Normal School at Normal, and the remainder is in the State Museum of Natural History, founded here in 1879, and now in charge of Professor Crook as its curator.

The officers of the society mainly responsible for its establishment and growth were its corresponding secretary, later called its general commissioner, and the curator of its museum. The former was its field agent and general manager, and the latter was the custodian of its collections. Its first corresponding secretary was C. D. Wilber, who served in that capacity until 1864. He subsequently became a mining engineer, much consulted by western railroads in the location and development of coal lands on their grants and in their neighborhoods. Its curator was for several years Dr. J. A. Sewall, instructor in chemistry in the State Normal School, at Normal, and afterwards president of the Colorado State University. Its second general commissioner, and afterwards the second curator of its museum, was Major J. W. Powell, who was in its service in the latter capacity when he made those remarkable western explorations, and especially that most remarkable expedition down the Colorado River of the West, which gave him world-wide fame and did much to make him later the United States Geologist. The third actual curator, serving, however, nominally as Major Powell's deputy, was Dr. George W. Vasey, afterwards for many years botanist to the United States Department of Agriculture at Washington; and the last to serve in this capacity was the present writer, appointed by the State Board of Education in 1872, after the state had acquired the museum, and continued as director of the State Laboratory of Natural History after the change of name and function finally made in 1879.

This society came into existence at a time so different from our own that we can derive little from its experience by way of either warning or instruction. Its period was that of the first active exploration and discovery of the scientific contents and economic resources of our territory, and of the first general impulse to the scientific education of the people; and the society was formed as an agency for a natural history survey of the state, in the old sense of an accumulation of museum specimens and a descriptive record of its zoology, botany and paleontology—meteorology and physical geography being nominally included, also, within the scope of the society. In 1858 the State Geological Survey was just getting on its feet, with Mr. Worthen appointed that year as its director. The normal school at Normal was the only state educational institution in Illinois, and that had been organized only one year. The state university was not founded until nine years thereafter, at which time, also, the state entomologist's office was first established.

Almost none of the men engaged in the work of this old society had anything approximating what we would now call a scientific education, and very few of them were what we would now call professional scientists or teachers of science, and yet they were evidently the pick of the state in scientific ability, enthusiasm and activity. Among its more efficient members, besides Powell, Vasey, Worthen and Thomas, already mentioned, were Benjamin D. Walsh, the first state entomologist; M. S. Bebb, well known for his work on the willows of the United States; Dr. Oliver Everett, of Dixon; James Shaw, of Mt. Carroll, and Dr. Henry M. Bannister, the last two assistants on the Geological Survey; Dr. J. W. Velie, a life-long ornitholo-

gist, still living in Michigan; and Dr. Frederick Brendel, of Peoria, author of many botanical papers, and also still with us, one of the very few survivors of the early membership. I must not omit, even in this briefest mention, the name of Professor J. B. Turner, of Jacksonville, first president of the society, famous in the history of the state universities because of his leadership in the pioneer movement for an industrial education of college grade; nor Dr. Edmund Andrews, of Chicago, who became one of the leading surgeons of that city; nor Newton Bateman, state superintendent of public instruction, who lent to the society the prestige of his great name—a most potent educational influence in that day.

You will wish, I am sure, to know something of the subjects in which the more prominent members were interested, and on which they wrote their papers for the society programs, and I will mention a few of them, taken at random. By Dr. Brendel: "Forests and Forest Trees of Illinois," "The Trees and Shrubs of Illinois," "The Oaks of Illinois," "Meteorology in connection with Botanical Investigations," "Additions to Robert Kennicott's Flora of Illinois." By Dr. Everett: "The Geology of a Section of Rock River Valley." By A. M. Gow, of Dixon: "Natural History in Schools." By R. H. Holder, of Bloomington: "A Catalogue of the Birds of Illinois." By James Shaw: "The Great Tornado of 1860." By Dr. Thomas: "Insects of Illinois, with Catalogue of Coleoptera," "Mammals of Illinois." These latter papers, it scarcely need be said, were extremely slight sketches of their subjects. By Dr. Vasey: "Additions to the Flora of Illinois," "The Pernicious Weeds of Illinois," "The Range of Arborescent Vegetation." By Dr. Walsh: "Insects Injurious to Vegetation in Illinois," "The Army-worm and its Insect Foes," "Insect Life in its Relation to Agriculture." By Mr. Wilbur: "The Mastodon giganteus, its Remains in Illinois." Most of these papers were published in the *Transactions* of the State Agricultural Society, some of them also in the *Prairie Farmer,* of Chicago, those being virtually the only avenues of publication open to students of science in Illinois in that day.

The society operated through an elaborate organization of special committees of its members, one for each division of the natural history of the state, each committee composed, of course, of unpaid volunteers who were made responsible for the accumulation and preparation of material for their several departments of the museum, and for contributions on their respective divisions of its natural history. This survey work was extremely irregular in amount and unequal in value, and its results were never organized by the society into a working collection. The curator was an instructor in the normal school, and seems to have received no pay from the society; but the general commissioner was supposed to give his entire time to its service. His salary was evidently uncertain in amount, and dependent largely on his success in securing entrance fees from new members. Financial complications arose—disputes as to ownership of property, difficulties in the payment of debts incurred, refusals to turn over to the treasurer the funds claimed by the society—and these, with other confusing and discouraging conditions, led to the withdrawal by members of gifts and deposits of specimens and a falling off in the active membership. The society finally collapsed chiefly because of its financial disabilities. Since it could neither pay adequately its general commissioner or its curator, nor organize its collections or publish its papers from its own resources, it turned to the state for aid, and found itself ultimately obliged to accept the condition

that its property should be transferred to the state, and that its curator should be appointed by a state board, as the price of continued appropriations; which, by the way, were largely drawn upon to outfit and maintain the Powell expeditions to the far west. (Fifteen hundred dollars directly appropriated by the State Board of Education.)

There is no doubt that this short-lived society brought a body of influential public opinion to the aid of state scientific and educational enterprises appearing during its existence, and that it did much to stimulate a general interest in scientific knowledge and research, and thus to hasten the introduction of the sciences into the public schools—influences which did not cease when its own organic life was ended. It also afforded to Powell the standing-ground from which he leaped into fame as an explorer, and won his way to a scientific career of the first importance, and it left in its museum nuclear collections which were later made useful in a revival and firm establishment of the original enterprise of the society, modified to suit more modern ideals, by the State Laboratory of Natural History. This first state society thus gave indirect origin to the state laboratory, with which the state entomologist's office became practically identified in 1883, much as the first geological survey of the state gave origin to our present state museum. If our new academy do no more, proportionately to its period and its environment, within the next ten years, it will amply justify our proceedings to-day.

By 1879, after an interval of eleven years from the actual dissolution of the old society, a virtually new situation had arisen in science, and especially in scientific education. Under the influence of Darwin and Agassiz and Huxley, a transforming wave of progress was sweeping through college and school, a wave whose strong upward swing was a joy to those fortunate enough to ride on its crest, but which smothered miserably many an unfortunate whose feet were mired in marsh mud. This wave reached central Illinois in the early seventies with the effect to bring about, in 1875, a summer school of natural history at the State Normal School—only two years, it will be noticed, after the first session of the Agassiz School at Penikese. Wilder, of Cornell, and W. S. Barnard, just back from Europe with a doctor's degree, were members of its teaching staff, together with Burrill, of the State University; Thomas, the state entomologist, and the present writer, who was also director of the school. Besides an abundance of living plants and animals of our own environment, we had great boxes and barrels of marine material in large variety, some of it received alive, secured by a most active collector engaged for the purpose, who scoured the New England coast for us from Portland to Buzzard's Bay. This school was a notable success, except that the Illinois instructors all worked for nothing and paid their own expenses; but the Centennial Exposition of 1876 deranged plans for its immediate continuance. In 1878, however, a second equally successful session was held, at the close of which its students spontaneously organized themselves into a natural history society, and appointed a committee of correspondence to extend its membership and enlarge its scope. As a consequence of the numerous and unanimously favorable responses to the letters following, a conference was held at the office of the state geologist in Springfield, December 12, 1878, and the secretary of this conference was instructed to call a convention at Chicago for the organization of a state natural history society.

Some forty persons responded to the call, and organized at the Palmer House, January 16, 1879, and letters were read from

fourteen others who wished to join the proposed society. The first officers were A. H. Worthen, of Springfield, president; T. J. Burrill, of Urbana, and H. M. Bannister, of Chicago, vice-presidents; Homer N. Hibbard, of Chicago, treasurer; S. A. Forbes, secretary, and Selim H. Peabody, of Champaign, and Cyrus Thomas, of Carbondale, additional members of the executive committee. By the close of the year sixty-six members had paid their initiation fees of three dollars each.

This was the period of the return to nature in the study of science, and annual field meetings were provided for. The first of these was held at Ottawa, July 10, 1879. Dividing into three sections—geological, botanical and zoological—under the leadership of Worthen, Burrill and Forbes, respectively, the society took to the woods in the beautiful, prolific and historically interesting valley extending along the Illinois River eighteen miles from Ottawa to Peru, and with Starved Rock, Deer Park, Buffalo Rock and the site of the famous Indian village at Utica within or near its boundaries.

Annual program meetings followed at Bloomington, Springfield, Urbana, Springfield, Peoria and Jacksonville; and field meetings at Lake George, Indiana, near Chicago, where a Chicago sportsmen's club placed their club-house, premises and equipment at our disposal; at Fountain Bluff and Grand Tower, on the Mississippi in southern Illinois; at Warsaw, in Hancock County, the home of Mr. Worthen; and at Peoria, where the Peoria Scientific Association joined us in a steamer trip up the Illinois River for aquatic work. These field meetings were well attended, as a rule, and were much enjoyed, although it must be confessed that they were perhaps more agreeable than permanently profitable to us. The annual meetings also were interesting to the participants, and did something, no doubt, to stimulate the workers among us, and something also to interest and instruct the communities in which they were held. Their average character may be well enough illustrated by the program of the Urbana meeting in 1882.

The first session was devoted to an address on "Primitive Religion in America," by Mr. McAdams, of Jerseyville, which was substantially an account of the religion of the Mound Builders as inferred from idols and other implements of a religious character which had been collected by the speaker. During the next session, Dr. Edwin Evans, of Streator, read a paper on "The Rock System of the Northwest," based mainly on the records of borings for artesian wells, and illustrated by maps and colored diagrams. This was followed by a paper on "Recent Microscopy," by Professor Burrill, of the university, giving a historical account of the development of the microscope and a description of its most recent improvements and performances; and this by a paper on "Prehistoric Remains in Southeastern Missouri," by F. S. Earle, of Cobden—essentially a classification and general description of mounds studied on a trip made for the Smithsonian Institution. A lecture on "The Fossil Tracks of the Connecticut Valley," by Don Carlos Taft, professor of geology in the university; a paper on "The Army-worm in 1881," by F. M. Webster, of Waterman; and one on "The Organs of the Sixth Sense of Blind Fishes," by S. A. Forbes, completed the program of the first day, which was followed by an evening reception to the society by the faculty and students of the university, and a microscope display given jointly by the university and the society.

The program of the following day contained a paper on "Sciences in the Public Schools," by C. W. Rolfe, of the university; one by Mr. McAdams on "The Great

Cahokia Mound of Madison County," of which the writer had just completed a survey; one by Professor Burrill on "Some Vegetable Poisons," and one by Mr. Forbes on "The First Food of the White-fish." Professor N. C. Ricker, of the university, read a paper on "The 'Blue Process' of Copying by Photography," just coming into use for the duplication of papers and drawings; James Forsythe, of Champaign, gave an account of the life history of a jellyfish studied by him at Beaufort, S. C.; Dr. Evans gave a paper on "The Subterranean Waters of the Northwest"—a discussion of the origin of the artesian waters of northern Illinois and southern Wisconsin; Mr. A. B. Seymour, botanist to the State Laboratory of Natural History, read a paper on "Field Work on Parasitic Fungi"; Mr. Cyrus W. Butler, also a state laboratory assistant, gave some zoological notes from the field-book of a naturalist; J. A. Armstrong presented an abstract of the papers read at a recent meeting of the University Natural History Society; and Professor Rolfe read brief papers on "Experiments with Germinating Seeds," and on "The Rings of Wood as indicating the Growth of Trees."

In 1880 the question of an enlargement of the field of the society to include the physical and mathematical sciences came up for discussion, and was decided negatively, on the ground that the interests represented by physicists, chemists and mathematicians were so separate from those of the naturalists that a common society was not desirable—a conclusion perhaps warranted in view of the kind of naturalists that most of us were.

In 1882, when the treasurer reported a balance of $150 in his hands and $122 more due from members in annual fees, the question of a publication of papers and proceedings was brought forward in the secretary's report and referred to a committee; but no steps were taken to that end on the ground that it was not desirable to multiply centers of publication unnecessarily, and that there was no lack of opportunity to publish really valuable papers in established periodicals.

Following upon these conclusions, and possibly in part because of them, the paid-up membership of the society began to decline. Indeed, of the sixty-six persons who completed their membership during the first year, thirty-nine did not continue their payments thereafter, and at the end of the second year the actual paid-up membership was fifty-two. The following year it was fifty-four, then fifty-two, then forty-three and finally, in 1884, it fell to twenty-seven. The executive committee took these facts to indicate that there was at the time no sufficiently general and urgent desire for the permanent maintenance of a society of this description to warrant its continuance, and after the Jacksonville meeting of 1885, which passed without a formal election of officers, it was not called together again.

And now I hardly need say that, after the lapse of twenty-two years of amazing progress in science and in scientific education, an entirely new situation again exists in Illinois—one so radically different from that of the early eighties that the conclusions then reached have no very important bearing on our problem of to-day. There are more college specialists here to-day from one department of one institution than there were in our whole membership in 1879. Indeed, that list is not so long that I can not give it to you now, to emphasize the contrast. It consisted of J. D. Conley, of Carlinville; T. J. Burrill, of Urbana; S. H. Peabody, of Champaign; Rev. Francis X. Shulak, of St. Ignatius College, and E. S. Bastin, of the old University of Chicago—five men, one of whom, Dr. Bastin, did not meet with us again.

Lindahl, of Rock Island, and Marcy, of the Northwestern, joined us in 1880, and Robertson, of Carlinville, in 1882, and a few additional members of the faculty of the State University paid us the compliment of an initiation fee when we held our meeting at Urbana, but went no farther with us. If there was any professional or active worker in biology or geology at any other Illinois college at the time, we never made his acquaintance nor he ours. Of the state scientific officials there were only Worthen, Thomas and Forbes. Thomas left the state in 1883, but the two others stayed with the society to the end.

It should be remembered, in this connection, that this was a time when college men, as a rule, worked like dray-horses and were paid like oxen, and the sacrifice of time and means necessary to prepare adequately for the annual and semi-annual meetings of the society, and then to attend them, was more than they could, or ought to, make, except for some really important end.

It will be seen that, under these conditions, our membership would now be almost wholly classed as amateurs. The active members of the last two years were chiefly collectors of specimens, and species-students of the old school—a few still-glowing brands from the enthusiasms of the exploration period, with scarcely a spark to testify to the coming illumination, in the midst of which it is our present privilege to live. And so the society passed, leaving no permanent material product of its work, except private collections and such papers of its members as were published here and there, as each individual thought best.

Does this account seem discouraging to our present undertaking? I do not think that it ought to; but quite the contrary. If, under such conditions, with so little material, and—as a reasonable modesty perhaps requires that I should add—under such general management, it was possible then for us to organize a state natural history society and to keep it actively at work for seven years, we ought now, I think, with all our present comparatively immense advantages, to found a state academy of sciences which shall live and thrive at least for seventy years, and, for all that I can see, for seventy times seven—by which time we shall all have been long relieved from all our responsibilities, and the labors and the honors of scientific enterprise will have been handed on to our remote successors.

S. A. Forbes

University of Illinois

MEDALS OF THE ROYAL SOCIETY[1]

The Copley medal is awarded to Professor Albert Abraham Michelson, foreign member of the Royal Society, on the ground of his experimental investigations in optics.

In 1879 Michelson brought out a determination of the velocity of light by an improved method, based on Foucault's which gave 299,980 kilometers per second. Three years later, by means of a modification of the method, capable of even greater precision, he found for this constant, of fundamental importance for electric as well as optical science, the value of 299,853 kilometers.

Michelson has been a pioneer in the construction of interferometers, which are now indispensable in optics and metrology. With his new instrument, at Paris, he determined the absolute wave-lengths of the red, green and blue lines of cadmium by counting the number of fringes (twice the number of wave-lengths) corresponding to the length of the standard meter of the Bureau International des Poids et Mesures. He found the meter to be 1,553,164 times the wave-length of the red line of cad-

[1] Concluding part of the presidential address of Lord Rayleigh—read at the anniversary meeting of the Royal Society on November 30.

mium, a result which is almost in exact agreement with the redetermination last year by Perot and Fabry. Michelson thus proved the feasibility of an absolute standard of length, in wave-lengths, of such accuracy, that if the standard meter were lost or destroyed it could be replaced by duplicates which could not be distinguished from the original.

He had the greatest share in the elaboration of precise experiments on the relative motion of ether and matter. He repeated in an improved form Fresnel's experiment of the speed of light in moving media, using water and sulphide of carbon. He found that the fraction of the velocity of the water by which the velocity of light is increased is 0.434, with a possible error of $\pm$ 0.02. The fact that the speed is less in water than in air shows experimentally that the corpuscular theory is erroneous; but his results, moreover, established the correctness of Fresnel's formula for the effect, the theory of which has since become well understood.

In conjunction with E. W. Morley, he devised and carried out a very remarkable method by which, on the assumption of ether at rest, an effect depending on quantities of the order $(v/V)^2$ would appear to be appreciable. No displacement of the fringes was found. Of this result the simplest explanation would be that the ether near the earth partakes fully in its orbital motion; but modern electric and optical science appears to demand a quiescent ether, and the existence of this and similar null results is fundamental for its theory.

He has shown the possible application of the interferometer method to astronomy, by himself measuring the diameters of the four satellites of Jupiter, which are only about one second of arc. He suggests the further application of the instrument to such of the fixed stars as may not subtend less than one hundredth of a second of arc.

In 1898 Michelson constructed a spectroscope which enables us to make use of the great resolving powers of the very high orders of spectra which are absent in the use of the ordinary grating, and with the added advantage of having most of the light in one spectrum. The echelon consists of a pile of glass plates of precisely equal thickness, which overlap by an equal amount; with it spectral lines which appear single with the most powerful gratings can be resolved into components. This instrument has been especially useful for the direct observation of the important, because definite, influence of magnetism on light, discovered by Zeeman. With thirty plates, and using the 25,000th spectrum, the echelon has a resolving power of 750,000, while the most powerful gratings do not exceed 100,000.

In connection with the analysis of radiations, he has constructed and used various machines for the analysis of periodic motions. For example, in conjunction with Stratton, he perfected a remarkable machine which is based on the equilibrium of a rigid body under the action of springs.

Professor Michelson has also investigated by his interferometer the important subject, both theoretically and practically, of the breadth and the structure of spectral lines, including the effect of a magnetic field, and in various other ways his genius has opened up new ground in experimental optics.

One of the Royal medals has been awarded, with the approval of His Majesty, to Dr. Ernest William Hobson, F.R.S.

During the last twenty years Dr. E. W. Hobson has been distinguished for the fundamental character of his contributions to mathematics and mathematical physics. His earlier published work, from 1888 onwards, deals largely with the so-called

harmonic analysis, which embraces many topics having for their common aim the solution of the potential equation in forms suitable for application to the problems of physics. The exhaustive examination of the general types of harmonic functions contained in his paper in the *Philosophical Transactions*, 1896, has been found to be of high utility for this application. He was led by these researches, and particularly by the difficulty of describing in general terms the characteristics of a function capable of being represented by Fourier's series, to take part in the revision of the logical basis of differential and integral calculus which is now in progress; his presidential address to the London Mathematical Society in 1902 on the questions here arising aroused general interest among mathematicians, and he has recently (1907) published an extensive volume dealing with the whole matter and its applications to the theory of Fourier's series, which is of great importance for the history and development of mathematics.

His Majesty has also approved the award of a Royal medal to Dr. Ramsay H. Traquair, F.R.S. Dr. Traquair is honored on the ground of his long-continued researches on the fossil fishes of Paleozoic strata, which have culminated, within the past ten years, in his discovery of new groups of Silurian and Devonian fishes, and in his complete exposition of the structure of *Drepanaspis, Phlyctenaspis* and other remarkable forms.

For nearly forty years Dr. Traquair has been busy with the description of fossil fishes, mostly from the Paleozoic rocks of Scotland, and he is deservedly held to be one of the most eminent paleontologists of the day. He has been highly successful in the interpretation of the often very obscure and fragmentary remains which he has had to elucidate, and his restorations of fishes have won such credit as to appear in all modern text-books of paleontology. It may be said that his work, notwithstanding the great difficulties of the subject, has well stood the test of time.

Dr. Traquair has done much to advance our knowledge of the osteology of fishes generally. His earliest memoirs on the asymmetrical skull of flat-fishes and on the skull of *Polypterus* remain models of exactness. His acquaintance with osteology enabled him to show how former superficial examination of the Paleozoic fishes had led to wrong interpretations. He demonstrated that *Chirolepis* was not an Acanthodian, as previously supposed, but a true Paleoniscid. In 1877 he satisfactorily defined the Paleoniscidæ and their genera for the first time, and conclusively proved them to be more nearly related to the sturgeons than to any of the other modern ganoids with which they had been associated. He thus made an entirely new departure in the interpretation of extinct fishes, replacing an artificial classification by one based on phylogenetic relationship. His later memoir on the Platysomidæ was equally fundamental and of the same nature.

All subsequent discoveries, many made by Traquair himself, have confirmed these conclusions, which are now universally accepted.

In 1878 Dr. Traquair demonstrated the dipneustan nature of the Devonian *Dipterus*, and somewhat later he began the detailed study of the Devonian fishes. His latest researches on the Upper Silurian fishes of Scotland are equally important, and provide a mass of new knowledge for which we are indebted to his exceptional skill and judgment in unraveling the mysteries of early vertebrate life.

The Davy medal is awarded to Professor Edward Williams Morley. Professor Edward W. Morley is well known both to chemists and to physicists for his work in the application of optical interferences and

other physical phenomena to increase the accuracy of measurement. Numerous valuable papers have appeared, either in collaboration with Professor Michelson and others, or in his own name, on such subjects. Special reference may be made to his experiments, in conjunction with Professor Michelson, on the fundamental question of the absence of effect of translatory motion of material bodies on luminous phenomena.

His claim to the Davy medal rests on grounds closely related to these researches, for he has combined thorough mastery of accurate measurement with an intimate knowledge of modern chemistry, and has utilized them in his attempt to solve one of the most difficult and fundamental problems of chemical science. The special problem to which he has consecrated many years of his life is the determination of the relative atomic weights of hydrogen and oxygen; it has been attacked by him with rare insight and skill, and with indomitable perseverance, and he seems to have settled it for many years to come, if not permanently. All the recent work devoted to this problem, and there has been much, has tended to establish more firmly the ratio arrived at by Professor Morley.

His determinations of the absolute weights of a liter of hydrogen and of oxygen, and his investigations of the amounts of moisture retained by gases dried by various desiccating agents, are of the very greatest importance for scientific progress.

Professor Wilhelm Wirtinger, of Vienna, is the recipient of the Sylvester medal. He is distinguished for the importance and wide scope of his contributions to the general theory of functions. Our knowledge of the general properties and characteristics of functions of any number of independent variables, and our ideas for the further investigation of such functions, are, for the most part, at present bound up with the theory of multiply-periodic functions, and this theory is of as great importance for general solid geometry as the ideas of Abel have proved to be for the theory of plane curves. Professor Wirtinger has applied himself for many years to the study of the general problems here involved. A general summary of his researches is given by him in the Abel centenary volume (XXVI., 1902) of the *Acta Mathematica*. Two of his papers may be particularly referred to, both of 1895. One of these deals with the reduction of the theory and general multiply-periodic functions to the theory of algebraic functions, with a view to their expression by theta functions; this was one of the life problems of Weierstrass, who did not, however, during his lifetime, publish anything more than several brief indications of a method of solution. Professor Wirtinger's memoir obtains a solution, and is, moreover, characterized throughout by most stimulating depth and grasp of general principles. This paper was followed by two others, one continuing the matter in detail, the other making an application of its principles to the general theory of automorphic functions. Another extensive paper, which obtained the Beneke prize of the Royal Society of Göttingen, deals with the general theory of theta functions. In it he obtained results of far-reaching importance, for geometry as well as for the theory of functions, the full development of which will require many years of work.

The Hughes medal is awarded to Principal Ernest Howard Griffiths. Principal Griffiths has conferred great benefit on physical science by his series of measurements of fundamental constants, mainly in the domain of thermal and electric energy. At a time when the equivalent of the thermal unit in mechanical energy stood urgently in need of revision, he devoted himself to the problem with all the refine-

ments and patient manipulation that could be devised, the result being a value for Joule's equivalent which at once acquired authority in the light of the evidence produced, and largely confirmed the corrections already advanced by Rowland and others. A main cause of discrepancy had been found to be the variation of the thermal capacity of water with the temperature; and by an investigation in which this variation was determined, Griffiths elucidated and correlated fundamentally the work of previous observers, from Joule onward. Of special importance also, in the domain of chemical physics, was an investigation of the depression of the freezing point of water by very dilute admixture of dissolved substances, wherein he verified, with all the refinement of absolute physical determinations, that the change of freezing point ran exactly parallel to the electric conductivity when the dilution of the electrolyzable salt was comparable to that of gases, being twice as much per molecule as the standard value of the depression for non-electrolytes.

The Buchanan medal is awarded to Mr. William Henry Power, C.B., F.R.S. Mr. Power's services to hygienic science and practise have extended over a period of more than thirty years, and have been of the most distinguished kind. He has himself personally conducted successful inquiries into the causes of the spread of various diseases, and has obtained results which have proved of the greatest benefit to mankind. Moreover, in his long connection with the medical department of the Local Government Board he has planned and directed numerous general and local investigations whereby our knowledge of disease, and of the methods of coping with it, have been greatly increased. The medical reports issued by the Local Government Board, which are universally regarded as among the most important contributions of our time to this subject, have for many years past been either written by him or owe much to his editorial criticism and supervision. It is not too much to say that no living man in this country has advanced the cause of scientific hygiene more than Mr. Power, or is more worthy of the distinction of the Buchanan medal.

SCIENTIFIC BOOKS

Research in China. Volume I., Part 2. *Petrography.* By Eliot Blackwelder. Carnegie Institution of Washington, Washington. 1907.

Rocks from northern and central China are described microscopically in this portion of the report; their field relations and stratigraphy have been given in Part 1 of this volume. The method of treatment is as individual specimens arranged according to geographical distribution, that is, by districts of which eleven are recognized. Their further arrangement is by geological age, mode of formation, and finally by petrographic character. The report is, therefore, a detailed statement of observations and data, with little attempt at general or comprehensive summary of results. The material collected is not considered sufficient for such a treatment.

The Khin-Gan district of the mountain range by that name in northwestern Manchuria, so far as seen from the Chinese-Eastern Railroad, appears to be made up largely of igneous rocks. In addition to a gray biotite-granite there are black quartz-porphyry, hornblende-porphyry, feldspar-porphyry and gray hornblende-granite.

In the western portion of the Liau-Tung peninsula in southern Manchuria the rocks observed belong to several distinct systems: The T'ai-shan gneissic complex; the Ta-ku-shan schists, quartzites and marbles; the Sinian sedimentary series including quartzite conglomerate and psammites of Cambro-ordovician age, besides igneous rocks in dikes. These are rhyolite porphyries, andesitic and basaltic porphyries, more or less altered.

In the neighborhood of Peking a small ridge

of greenish aporhyolite occurs. It appears to have been at one time a glassy rock.

The western Shan-Tung district contains rock formations ranging from the oldest Pre-Cambrian to early Mesozoic (?), consisting of rocks of metamorphic, igneous and sedimentary origin. The oldest rocks are gneisses and schists. Embracing biotite-gneiss, biotitic-hornblende-gneiss, hornblende-gneiss, and schists of similar composition. With these are associated biotite granites. The limestones and shales forming the Sinian system present features of interest in the oolitic concretions that have been extensively developed, and have subsequently undergone recrystallization into aggregates of coarser crystals, and in the conglomeratic character of some of the limestone interformational conglomerates. These sedimentary rocks are described in detail. Associated with the Sinian series are basaltic and dacitic porphyries, besides syenitic and quartz-syenite porphyries in dikes and intruded sheets. The carboniferous strata overlying the Sinian series are traversed by dikes and sheets of various kinds of rocks, and by some extrusive flows of basalt. The commonest rocks are basalts and syenite-porphyries, with some dacites and andesites. There is also less commonly gabbro and peridotite.

In western Chï-Li there is a complex of gneisses, schists, granites and porphyries covering extensive areas. So far as evidence was found, the metamorphic rocks appeared to be mostly of igneous origin; in one instance there was proof of a sedimentary source. This complex is followed by the Ta-yang series of limestones, with shale and quartzite, of Algonkian age; and by the sedimentary rocks of the Sinian system.

The Wu-T'ai district consists mostly of metamorphosed Algonkian sediments, some of which are highly altered, while others are but slightly changed, resembling in places Paleozoic rocks. The more metamorphosed series called the Wu-T'ai system consists of mica-schists, gneisses, garnet-schists, chlorite-schists, quartzites, marble, schistose conglomerates, arkoses, etc. With these are some eruptive rocks, more or less metamorphosed: granite, augen-gneiss, hornblende-schists, quartz-porphyries, etc. The less metamorphosed series, the Hu-T'o system, consists of slates, graywackes, limestones and quartzites, with fewer igneous rocks, in dikes, both basic and acid. The district also contains rocks of the Sinian system.

The rocks of the Ts'in-ling district are mostly sedimentary; either highly metamorphosed or only slightly altered. There are also large intrusions of granite and occasional dikes of other igneous rocks. The same may be said of the Han River district, the rocks of which are described in considerable detail.

The Yang-Tzï Gorge district is chiefly sedimentary rocks of Paleozoic age, with local exposures of Mesozoic and Pre-Cambrian terranes. They are strongly but not intensely folded, and are not notably metamorphosed, except the oldest formations.

The report closes with a résumé of literature containing descriptions of the rocks of China, which shows that very little has been done in this direction. Mr. Blackwelder's report is a valuable contribution to the petrography of the region, and it is to be regretted that he was not in a position to pursue his studies more thoroughly and systematically, and that no chemical analysis of the best of his material was undertaken.

J. P. IDDINGS

Annual Reports of the Progress of Chemistry for 1906. Issued by the Chemical Society. Vol. III. London, Gurney and Jackson. 1907. Pp. 387. Price $2 net.

The development of chemistry in many different directions is so very rapid that it is impossible for any one to keep informed even with regard to the important work which is published in the various fields. The reports of progress which are published annually, by the London Chemical Society, serve, therefore, a very useful purpose in bringing together a summary of the really important advances of the science during a given year. The divisions of the present volume are: General and Physical Chemistry, by Alexander Findlay; Inorganic Chemistry, by P. P. Bedson; Organic Chemistry—Aliphatic Division,

by H. J. H. Fenton; Homocyclic Division, by J. B. Cohen; Heterocyclic Division, by J. T. Hewitt; Stereochemistry, by W. J. Pope; Analytical Chemistry, by A. C. Chapman; Physiological Chemistry, by W. D. Halliburton; Agricultural Chemistry and Vegetable Physiology, by J. A. Voelcker; Mineralogical Chemistry, by Arthur Hutchinson, and Radioactivity, by Frederick Soddy. It will be seen at once that many of these authors are well known authorities in their various fields. The topics chosen for presentation are well selected and the treatment is clear and concise. The copious references to the literature render the book a valuable index for one who wishes to follow any subject further, while the discussions are sufficiently full, in most cases, to be extremely useful to those who read for the purpose of broadening their general knowledge of the science.

W. A. Noyes

SCIENTIFIC JOURNALS AND ARTICLES

The American Naturalist for November opens with an article on the "Response of Toads to Sound Stimuli" by S. A. Courtis showing that there is very little response to anything save the mating call. But—why should there be? The sound of a bell, a whistle or any similar noise carries with it no association. Why not feed the toad each time the bell is rung and note what the result would be after a month or two? Max Morse contributes "Further Notes on the Behavior of *Gonionemus*," mainly in respect to the influence of light, and Edward W. Berry has a paper on "Pleistocene Plants from Alabama," noting that they indicate a climate about the same as at the present time. Frederic T. Lewis has "A Further Study of Leaf Development," concluding that there is a determinate evolution of leaf forms. E. A. Andrews discusses "Earthworms as Planters of Trees," showing that they do this by gathering seeds, such as those of the maple, with which to plug the openings of their burrows. T. H. Morgan considers "The Cause of Gynandromorphism in Insects." There are various points of interest in the notes and reviews. We think few will agree with Professor Montgomery that physiological evidence is better calculated to show relationships or differences that are anatomical or, what is the same thing, paleontological.

Laboratory Bulletin No. 13, of Oberlin College, is on "The Development of Nestling Feathers," by Lynds Jones. It contains a series of detailed observations, and notes among other things that the first down has no shaft and no quill, the barb vanes passing without interruption into the first definitive feather vanes, the seeming quill being due to the coalescence of the vanes of the down.

The first number of the *Bulletin of the Brooklyn Conchological Club* has just been issued. It contains among other papers articles on "Abnormal Shells" and a "List of Long Island Shells," by S. C. Wheat, and "Suggestions for the Organization of a National Conchological Society," by W. H. Dall.

SOCIETIES AND ACADEMIES

THE CONVOCATION WEEK MEETING OF SCIENTIFIC SOCIETIES

The American Association for the Advancement of Science and the national scientific societies named below will meet at the University of Chicago during convocation week, beginning on December 30, 1907.

American Association for the Advancement of Science.—December 30–January 4. Retiring president, Professor W. H. Welch, The Johns Hopkins University, Baltimore, Md.; president-elect, Professor E. L. Nichols, Cornell University, Ithaca, N. Y.; permanent secretary, Dr. L. O. Howard, Cosmos Club, Washington, D. C.; general secretary, President F. W. McNair, Houghton, Mich.

Local Executive Committee.—Charles L. Hutchinson, chairman local committee; John M. Coulter, chairman executive committee; John R. Angell, Thomas C. Chamberlin, Joseph P. Iddings, Frank R. Lillie, Charles R. Mann, Robert A. Millikan, Charles F. Millspaugh, Alexander Smith, J. Paul Goode, local secretary.

Section A, Mathematics and Astronomy.—Vice-president, Professor E. O. Lovett, Princeton University; secretary, Professor G. A. Miller, University of Illinois, Urbana, Illinois.

Section B, Physics.—Vice-president, Professor Dayton C. Miller, Case School of Applied Science;

secretary, Professor A. D. Cole, Vassar College, Poughkeepsie, N. Y.

Section C, Chemistry.—Vice-president, Professor H. P. Talbot, Massachusetts Institute of Technology; secretary, Professor Charles L. Parsons, New Hampshire College, Durham, N. H.

Section D, Mechanical Science and Engineering.—Vice-president, Professor Olin H. Landreth, Union College; secretary, Professor Wm. T. Magruder, Ohio State University, Columbus, Ohio.

Section E, Geology and Geography.—Vice-president, Professor J. P. Iddings, University of Chicago; secretary, Dr. Edmund O. Hovey, American Museum of Natural History, New York City.

Section F, Zoology.—Vice-president, Professor E. B. Wilson, Columbia University; secretary, Professor C. Judson Herrick, University of Chicago.

Section G, Botany.—Vice-president, Professor C. E. Bessey, University of Nebraska; secretary, Professor F. E. Lloyd, Desert Botanical Laboratory, Tucson, Arizona.

Section H, Anthropology and Psychology.—Vice-president, Professor Franz Boas, Columbia University; secretary, George H. Pepper, American Museum of Natural History, New York City.

Section I, Social and Economic Science.—Vice-president, Dr. John Franklin Crowell, New York City; secretary, Professor J. P. Norton, Yale University, New Haven, Conn.

Section K, Physiology and Experimental Medicine.—Vice-president, Dr. Ludvig Hektoen, University of Chicago; secretary, Dr. Wm. J. Gies, College of Physicians and Surgeons, Columbia University, New York City.

Section L, Education.—Vice-president, Hon. Elmer E. Brown, U. S. Commissioner of Education; acting secretary, Professor Edward L. Thorndike, Teachers College, Columbia University, New York City.

The American Society of Naturalists.—December 28. President, Professor J. Playfair McMurrich, University of Toronto; secretary, Professor E. L. Thorndike, Teachers College, Columbia University, New York City. Central Branch, president, Professor R. A. Harper, University of Wisconsin; secretary, Professor Thomas G. Lee, University of Minnesota, Minneapolis, Minn.

The American Mathematical Society. Chicago Section, December 30, 31. Chairman, Professor Edward B. Van Vleck; secretary Herbert E. Slaught, 58th St. and Ellis Ave., Chicago, Ill.

The American Physical Society.—President, Professor E. L. Nichols, Cornell University; secretary, Professor Ernest Merritt, Cornell University, Ithaca, N. Y.

The American Chemical Society.—December 27–January 2. President, Professor Marston T. Bogert, Columbia University; secretary, Professor Charles L. Parsons, New Hampshire College, Durham, N. H.

The Association of American Geographers.—December 31–January 1. Acting-president, Professor R. S. Tarr, Cornell University, to whom correspondence should be addressed; secretary, Albert P. Brigham, 123 Pall Mall, London, Eng.

The Entomological Society of America.—Secretary, J. Chester Bradley, Cornell University.

The Association of Economic Entomologists.—December 27, 28. President, Professor H. A. Morgan, Knoxville, Tenn.; secretary, A. F. Burgess, Columbus, Ohio.

The American Society of Biological Chemists.—December 30–January 2. President, Professor Russell H. Chittenden, Yale University; secretary, Professor William J. Gies, College of Physicians and Surgeons, Columbia University, New York City.

The Society of American Bacteriologists.—December 31–January 2. Vice-president, F. D. Chester, Delaware Agricultural College, Newark, Del.; secretary, Professor S. C. Prescott, Massachusetts Institute of Technology.

The American Physiological Society.—Beginning December 31. President, Professor W. H. Howell, Johns Hopkins University; secretary, Professor Lafayette B. Mendel, 18 Trumbull St., New Haven, Conn.

The Association of American Anatomists.—January 1–3. President, Professor Franklin P. Mall; secretary, Professor G. Carl Huber, 1330 Hill St., Ann Arbor, Mich.

The American Society of Zoologists.—Central Branch. Secretary, Professor Thomas G. Lee, University of Minnesota, Minneapolis, Minn.

The Botanical Society of America.—December 31 and January 1, 2 and 3. President, Professor George F. Atkinson, Cornell University; secretary, Dr. D. S. Johnson, Johns Hopkins University.

The Botanists of the Central States.—Business Meeting. President, Professor T. H. Macbride, University of Iowa; secretary, Professor H. C. Cowles, University of Chicago, Chicago, Ill.

The American Psychological Association.—December 31, January 1 and 2. President, Dr. Henry Rutgers Marshall, New York City; acting secretary, Professor R. S. Woodworth, Columbia University, New York City.

The Western Philosophical Association.—Secre-

tary, Dr. John E. Bowdoin, University of Kansas, Lawrence, Kans.

The American Anthropological Association.—December 30, January 4. President, Professor Franz Boas, Columbia University; secretary, Dr. Geo. Grant MacCurdy, Yale University, New Haven, Conn.

The American Folk-lore Society.—December 30–January 4. President, Professor Roland B. Dixon, Harvard University; secretary, Dr. Alfred M. Tozzer, Harvard University, Cambridge, Mass.

Other national societies will meet as follows:

NEW HAVEN

The American Society of Zoologists.—Eastern Branch. December 26, 28. President, Dr. C. B. Davenport, Cold Spring Harbor, N. Y.; secretary, Professor W. L. Coe, Yale University, New Haven, Conn.

The American Society of Vertebrate Paleontologists.—December 26–28. President, Professor Bashford Dean, Columbia University; secretary, Professor Frederick B. Loomis, Amherst College, Amherst, Mass.

NEW YORK

The American Mathematical Society.—December 27, 28. President, Professor H. S. White, Vassar College; secretary, Professor F. N. Cole, Columbia University.

ALBUQUERQUE, N. M.

The Geological Society of America.—December 30–January 4. President, President Charles R. Van Hise, University of Wisconsin; secretary, Dr. Edmund O. Hovey, American Museum of Natural History, New York City.

ITHACA

The American Philosophical Association.—December 26, 28. President, Professor H. N. Gardiner, Smith College; secretary, Professor Frank Thilly, Cornell University, Ithaca, N. Y.

NEXT SUMMER, AT SOME PLACE TO BE DETERMINED

The Astronomical and Astrophysical Society of America.—President, Professor Edward C. Pickering, Harvard College Observatory; secretary, Professor Geo. C. Comstock, Washburn Observatory, Madison, Wisconsin.

DISCUSSION AND CORRESPONDENCE

BADGES AND EXPENSES OF THE AMERICAN ASSOCIATION

To the Editor of Science: I am interested in Professor C. L. Speyer's letter on pages 834–835 of the last number of Science. His idea of posting an alphabetical list with numbers corresponding to those on the badges, in a conspicuous, accessible place on the wall of the registration room is an excellent one. I was not poking fun at him when I expressed myself as pleased with the idea, at the New York meeting, and, in fact, I made a memorandum of the suggestion for possible use at Chicago. The alphabetical list is an excellent thing, but the expense of publication is very considerable and the Association is far from rich. Of the three dollars a year dues paid by each member, two dollars go to the publishers of Science, leaving one dollar from each member to pay the entire expenses of the association. It is quite possible that the council will direct the publication of a numbered list of members in attendance at Chicago, and then of course it will be done. The buttons for this year have already been ordered and delivered, so that it is too late to change the style. The delay by which Professor Speyers and others were inconvenienced last year occurred through the failure of the contractors to deliver the buttons at the specified time.

L. O. Howard,
Permanent Secretary

[It should perhaps be added that since Science has been sent to members of the American Association, beginning in 1901, about 4,000 new members have joined and their entrance fees, amounting to about $20,000, have been available for current expenses. But it is, of course true that a dollar from each member, even if the sum of $3,000 a year from entrance fees is added, does not adequately defray the expenses of the office of the permanent secretary, of the arrangements for the meetings and of publication of the proceedings. It is also true that $2 from each member does not pay the cost of printing Science. In Great Britain it costs $12.50 a year to be a member of the British Association and to receive *Nature;* in France it costs $10 a year to be a member of the French Association and receive the *Revue Scientifique.* Here where the purchasing power of money is less it costs $3 a year to be a member

of the American Association and to receive SCIENCE. In order that the work of the association may be carried forward effectively, its membership should be increased to at least ten thousand, and it does not seem to be impossible to accomplish this when we know that the National Geographic Society has by concerted efforts increased its membership to over twenty-five thousand. It would in fact be about accomplished if each member would send one nomination to the permanent secretary. ED.]

QUARTZ AFTER PROCHLORITE AT CRANSTON AND WORCESTER AND COAL PLANTS AT WORCESTER

TO THE EDITOR OF SCIENCE: During the recent field day of the New England geologists at Providence we were guided by Professor Brown to the graphite mine in the Carboniferous at Cranston. This mine interested me very greatly because of its close resemblance to the coal mine at Worcester, Mass., a resemblance which extended by chance even to the size and shape of the excavation and the dip of the rocks. There was the same greatly mashed and slickensided graphitic slate, the same white and yellow efflorescence of alumina and iron sulphates and a more abundant development of ottrelite in the adjacent schists. Our attention was especially attracted by a white to pale green mineral which filled fissures in the slate with its fine satiny fibers.

This was described as asbestus by Dr. J. W. Webster in the first volume of Silliman's Journal in 1819, and in a note the editor speaks of it as long known. It has been often mentioned since as asbestus, amianthus, or fibrolite. Its action under the microscope was so peculiar that I had it analyzed at Washington by Mr. L. G. Eakins. It proved to be a prochlorite changed in varying degrees to silica. The mean of the analyses roughly recalculated, to omit impurities, was: SiO_2, 23.13; Al^2O^3, 22.38; FeO, 28.76; MgO, 11.70; Alk, 1.57; H_2O, 12.45. The fibrous structure seems to be a parting developed in the chlorite by pressure as often happens in the case of muscovite.

The fact that this very peculiar metamorphosis of the carboniferous shales of the Rhode Island basin is exactly repeated at Worcester would be strong evidence that the rocks were of the same age without the coal plants which were found at the Worcester locality some years ago by Mr. J. H. Perry and determined to be Lepidodendron acuminatum by Lesquereux.

This note is written because doubt was expressed at the meeting as to the carboniferous age of the Worcester beds, and an old suggestion was brought up that the fossils were not authentic, that they were perhaps brought there to "salt" the mine. The slabs with fossils were dug up near the mine, one was a foot and a half long and several inches thick; and they were found by two persons at different times and were of exactly the same peculiar graphitic character as the rest of the rock at the mine and equally useless as a fuel, and there is no known locality showing exactly the same characteristics, since even at the Cranston locality the metamorphosis has been a little more severe and no fossils are found there.

The Worcester "coal mine" is the only fossiliferous locality between Providence and Bernardston on the Connecticut, and while there is no doubt that the fossils are coal plants and were found *in situ*, the common characteristics of the Worcester and Rhode Island beds are so many and so peculiar, and the succession is so similar that no doubt should arise as to their common age.

B. K. EMERSON

AMHERST, MASS.,
November 21, 1907

A SALAMANDER–SNAKE FIGHT

WHILE studying the geology of Buck Peak, twelve miles west of Riddle, Douglas Co., Oregon, last September, I saw a mortal combat that interested me very much because so anomalous. James Storrs, a mountaineer and trapper of California, well acquainted with the habits of wild animals, was with me at the time and remarked that it was "the first ring engagement he had ever seen in which the salamander showed any sand." In these

strenuous days of nature faking it is after all not surprising that even the salamanders are beginning to take an active part in affairs.

We watched the progress of the fight for a few moments each time at intervals of about forty-five minutes for three hours.

Thinking that the occurrence might be familiar to herpetologists, I sent a brief account of it to my friend Dr. C. Hart Merriam for information. In his reply he regarded the observation as important and expressed a request that the account be published in SCIENCE as a matter of permanent record.

The combatants were a salamander and a garter snake. The salamander was about eight inches in length, of a rather dark brown color above and lighter below. On the back and sides including the tail were irregularly elongated roundish darker spots. His smooth skin was naturally moist and being plump and chunky he seemed to be a bull-dog of his kind. Judging from the specimens kindly shown me by Dr. Stejneger in the National Museum the salamander was probably an *Amblystoma*.

The garter snake was of good size, about two feet in length, and with other stripes had reddish-brown markings on the sides. Both animals seemed to be in perfect condition for a hard fight.

When first seen in a narrow dry water course I supposed that the snake was swallowing the salamander, but the squirming of the snake attracted closer attention and the salamander was found to have a firm grip on the snake at the base of the right jaw and neck. The snake could not bite the salamander but writhed so as to turn him over and over and drag him along on his side or back without affecting the grip of the salamander. His whole attention seemed to be given to holding on without caring whether he was right side up or not.

This moderately active writhing in which the snake furnished all the energy continued for over two hours with gradually waning strength on the part of the snake. In the course of the struggle they passed beneath a bank and out of sight, but when last seen, half an hour later they were out again at the old place. This time all was quiet. The salamander was now in control. He had changed his grip. He was directly in front of the snake and had a deep hold on its upper jaw covering its nostrils. The lower jaw of the snake was hanging limp. The salamander seemed fresh in the enjoyment of his victory, while the snake was nearly dead.

J. S. DILLER

U. S. GEOLOGICAL SURVEY,
WASHINGTON, D. C.,
December 7, 1907

TROTTING AND PACING: DOMINANT AND RECESSIVE?

IN his book, *The American Trotter*, Mr. S. W. Parlin makes several allusions to the production of pacers by trotters which suggested to me the likelihood that the pacing gait may be a Mendelian recessive in the horse. In reply to my questions, Mr. Parlin, who has kindly interested himself in the matter, assures me that he has never known a natural trotter produced by two natural pacers, though, of course, pacers are often produced by trotters. Mr. John Thayer, of Lancaster, Mass., tells me that his experience agrees with that of Mr. Parlin. Certain alleged cases to the contrary have proved to be given erroneously. It seems, therefore that there is *prima facie* reason to suppose that the trotting gait depends on some physiological factor which is absent from the pacer. My object in writing this letter is to suggest to American readers the desirability of investigating the subject more fully. The materials for doing so are not to be had in England. It is scarcely necessary to point out the extraordinary interest of this illustration of Mendelian inheritance, if it should prove to be genuine. No doubt either gait may to some extent be acquired artificially by training, but I understand that the distinction between the natural trotter and the natural pacer is so definite that doubtful cases are exceptional.

W. BATESON

CAMBRIDGE, ENGLAND,
December 13, 1907.

QUOTATIONS

POPULAR SCIENCE[1]

IN the December number of *The Popular Science Monthly* Dr. William Morton Wheeler, of the American Museum of Natural History, has an article on "The Origin of Slavery among Ants." Such a jumble of sesquipedalian words and false analogies it would be difficult to find even inside the covers of a work on physiological psychology. We shall quote some sentences taken almost haphazard as specimens of the turgid nonsense so pompously pieced together by this pretentious sciolist. He writes on the most nebulous questions with an air of dogmatic infallibility which he himself would resent in a decree of Pius X. He is a type of a class of men rapidly growing in the United States, shallow-brained and half-educated, and intoxicated with the exuberance of their own barbarous phraseology.

Lest we should leave ourselves open to the suspicion of unfair criticism we shall give illustrations of this fellow's ridiculous jargon. As will be easily seen no Irish hedge schoolmaster discussing Virgil's birth in a portmanteau in the pages of Carleton's romances ever did perpetrate more puerile attempts to parade an aggregation of inane verbosity. "Slavery or dulosis," he tells us in the opening sentence of his second paragraph, "is a rare phenomenon among ants." What was the motive for introducing the word dulosis? It is derived from doulos, the Greek word for slave, and means precisely the same thing as slavery. Was it introduced to show that the author had some knowledge of Greek, or was it interposed to clarify his meaning and make science popular? *Omne ignotum pro magnifico.* Many persons are so constituted that they worship the unknown and "It's all Greek to me" has come to be synonymous with ignorance. In this way Wheeler throws dust in his reader's eyes and conceals the scantiness of his knowledge.

Here is another example of a vacuum filled up by a compound Greek word: "An eminently predatory species thus comes to live in intimate *symbiosis* with workers of an alien species which are said to function as slaves or auxiliaries." Symbiosis is derived from the Greek preposition *syn,* meaning together, and the word *bios,* meaning life. The writer's idea is that these predatory species live in communities, or in common. But in order to inject a Greek word, parade his erudition, and confound the reader he has recourse to a barbarous circumlocution, an absurd tautology which when literally translated into ordinary language reads: "An eminently predatory species thus comes to live in intimate common living," etc. The two passages examined are taken from the same paragraph. Immediately afterwards we stumble on the literary gem: "The colony grows apace, the workers increasing in number, size and *polymorphism* with successive broods." Similar vaporings meet the vision at every stage of the article.

Wheeler is a blatant bigot, a hater of Christianity, a man who out-Herods Herod and out-Haeckels Haeckel. He dwells with pride on his monkey ancestry and he is not without many of the apish instincts of the ourang-outang. Animalism as opposed to intellectualism is his philosophy. He has long dwelt among stuffed mastodons and ichthyosauri, and his mind, dwarfed by his environment, has no higher ideal than an ant-heap or a skeleton. If he undertakes to explain the highest spiritual attainments of man or to interpret the most complex forms of social organization he goes for light to the hænatococcus or to the mosquito. Logic is utterly discarded by him. He knows as much about the laws of dialectics as, to use Luther's

[1] This comment on the work of one of the most distinguished American naturalists exploits a point of view which readers of SCIENCE probably regard as obsolete. The editorial article is immediately preceded by an autograph letter, which, as translated, reads: "To our beloved children, the writers and readers of *The New World,* published in Chicago, under the auspices of the Most Reverend Archbishop of that city:—We impart with cordial affection our apostolic benediction and invoke for them every good and salutary gift in the Lord. From the Palace of the Vatican, 6th day of April, 1907.—PIUS X., Pontifex Maximus."

expression, a cow does about a new gate. But like all sciolists he is absolutely cocksure in his views, especially when settling for all time a great religious or moral problem. Young students, we are told, as they see him strutting across the museum campus are wont to recite Goethe's famous lines:

> Who's that stiff and pompous man?
> He walks with haughty paces,
> He snuffles all he snuffle can,
> He scents the Jesuit's traces.

Referring to a certain form of parasitism he writes: "It is not confined to ants and other social insects, but has analogies also in human societies (trusts, grafters, criminal and ecclesiastical organizations)," etc. Ecclesiastical organizations are classified with trusts, grafters and criminal hordes! Whither are we drifting in America, when a pigmy scientist can dare to write thus in a magazine that is widely read even by Catholics? Did not Voltaire and the Encyclopedists by writing cheap science in the nastiest form, like Wheeler, undermine Christianity in France? And if the Catholic body in this country supinely submits to be traduced and caricatured by every addle-pated scientist who, by pull and lobbying, lands himself in a position for which he has no visible qualifications, the enemies of religion, encouraged by such impunity, will redouble their efforts to supplant the kingdom of God by the Worship of Mammon and materialism.

Is the Catholic Church a parasite in the United States? Then Marquette was a parasite in Illinois. Who was a greater benefactor of our sovereign state than he? From the Atlantic to the Pacific and from Alaska to the Gulf, almost every county has its shrine that commemorates the heroic sacrifices and the imperishable services of priests to civilization and the commonwealth. Was Archbishop Carroll of Baltimore, the great patriot and the intimate friend of Washington, a parasite, or Archbishop Hughes, Lincoln's friend and ambassador to Europe, a parasite? Were the sisters of our religious communities, who ministered during the civil war to the boys in gray and to the boys in blue with the undiscriminating catholicity of their devoted hearts, parasites? Is the Catholic Church in Chicago at the present hour, educating as it does 100,000 children, thus saving the city more than $3,000,000 annually, parasitical? But what does Wheeler care about all these striking facts, these sublime spiritual achievements compared with the gyrations of a queen bee or the evacuations of a *Formica rufescens*?

The Popular Science Monthly has long been a peril to Catholic faith and morals. We know Catholic homes in which the faith has been blunted in boys and girls under twenty years of age through contact with that shallow organ of materialistic evolution. Catholic fathers and mothers would never place it within reach of their offspring did they know the deadly moral poison that pervades many of its pages.—*The New World.*

ASTRONOMICAL NOTES

THE PLANET MARS

Discussion as to the conditions for intelligent life on Mars continues to hold the attention of the public. Many of the magazines and daily papers have contained articles on the subject. Professor Percival Lowell is the central figure in this discussion. He holds the center of the stage not less for the brilliant manner in which he has presented his views to the public, than for the enthusiasm and skill with which he has carried on his observations.

The recent Lowell expedition to South America, under the direction of Professor Todd, well known for his extended travels in search of the eclipsed Sun, has added to the general interest. A site was selected on the desert pampa, at a moderate elevation, near Iquique, Chile, where the conditions were found to be exceptionally favorable. Mars, when on the meridian, was within a few degrees of the zenith. Special effort appears to have been made to keep the public informed of the details of the expedition, and the announcement was early made that photographs had been obtained showing the canals double.

What may be regarded as the human side of the problem undoubtedly appeals strongly to

the average reader. This calls for neither surprise nor criticism. If it could be demonstrated, beyond reasonable doubt, that intelligent life, similar to our own, existed on some neighboring world, all men would wish for a time to turn astronomers.

There are two somewhat distinct problems; first, the determination of the facts so far as that is possible, especially the correct delineation of the surface markings, not merely the subjective impression but the objective reality. Second, the interpretation of the observed phenomena. The first is largely a matter of observation, the second, of speculation. Owing to inherent difficulties, it is probable that the observed facts will never be so definite as to exclude a wide range of interpretation.

Some of the difficulties which stand in the way of our knowledge concerning Mars were discussed by Professor Simon Newcomb in the July number of *The Astrophysical Journal*. According to Professor Newcomb, it is theoretically impossible, owing to instrumental aberration, to see fine, sharp lines, such as are shown in drawings of Mars, even if they exist on the planet. Various psychological problems also enter into the discussion, in addition to physiological ones. Professor Lowell, in a reply in the October number of the same journal, assails Professor Newcomb's position both from the theoretical and practical side.

Meanwhile, those observers who do not see the finer details which are shown on the elaborate drawings of the planet have awaited with interest the publication of the photographs, which it is claimed verify them. A display was recently made, at the Massachusetts Institute of Technology, Boston, of a large number of transparencies, reproduced from the negatives of Mars which were made both in Arizona and in South America. The original negatives, in both places, were obtained by the use of a color screen used in connection with special plates. These photographs undoubtedly mark a distinct advance in planetary photography, and much credit is due to Messrs. Lampland and Slipher, Professor Lowell's assistants. The photographs made in Chile excel slightly those obtained earlier in Arizona. All show the broader markings on Mars much better than any obtained elsewhere. In a general way they corroborate the synchronous drawings by Professor Lowell. So far as the writer could determine, however, from a careful examination of the transparencies, they do not show any of the long, straight, and sharply defined canals shown on many drawings, nor was any trace of doubling visible. It is possible, of course, that groups of fine details, which appear distinct in the brief intervals of good seeing, may be blended on the photograph into the broad shadings shown on the transparencies. Though not out of harmony with the drawings, it is difficult, nevertheless, to see how the photographs can be regarded as confirming the details. Assuming the drawings to be correct, the photograph even now, compared with the eye, is a very poor second in the delineation of planetary detail. On the other hand, the photographs show nearly as much as has been seen by many conservative observers of Mars.

Too much importance need not be attached to the doubling of the canals. Whether this is a reality or an illusion does not appear to affect seriously the problem of intelligent life. Even if photographs should be obtained showing the canals distinctly double, the objective reality of the phenomenon would not thereby be absolutely assured, that is, photographs like figures sometimes lie. A striking case in point was the announcement, in 1890, by an English astronomer, of α Lyræ as a spectroscopic binary, from the duplicity of the lines of its spectrum as shown on photographs. This was an error due to causes never explained. This case is unusual only on account of its publicity. An artificial duplicity is one of the ordinary dangers which must be guarded against in astronomical photography. Sometimes the causes are apparent, at other times they are extremely obscure.

The subject is one which appeals strongly to the imagination. That intelligent life is confined to our earth alone, out of the many millions of worlds, seems absurd. Whether it exists at the present time on Mars is a fair problem to be decided according to the evi-

dence. That its existence forms the most simple explanation of the peculiar features of the Martian landscape is probably doubted by most astronomers. Indeed, the objective reality of many of these peculiarities can not be said to have been established beyond doubt. It can at least be safely stated that nothing amounting to a demonstration of the existence of intelligent life on Mars has yet been accomplished.

S. I. Bailey

BOTANICAL NOTES

THE COMING BOTANICAL MEETINGS IN CHICAGO

In a short time the annual gathering of botanists will take place in Chicago in connection with the meetings of the American Association for the Advancement of Science. Through the persistent efforts of disinterested and patriotic men we do not now have a divided body of botanists in this country, all the botanical societies now having merged in the one organization—the Botanical Society of America. This merging has consolidated American botanists in a most satisfactory manner, and has done much to bring them together in a compact, harmonious working body. This is quite as it should be. Botany is not so large and wide as to make it necessary that it should be parceled out among a number of groups of workers.

But the merging of these affiliated societies does not wholly settle the question of the meetings, for we still have officially two bodies of botanists, namely the Section of Botany (G) of the American Association for the Advancement of Science, and the Botanical Society of America. Last year there was not a little confusion in the meetings of these two bodies, and on at least one occasion both were in session at the same time. It is to be hoped that the plans that are now being talked over by the officers of both organizations will result in avoiding such conflicts in the future. There is time enough, certainly, for all of the papers to be read that are worthy of taking the time of the botanists of the country, without having simultaneous sessions.

The writer has on more than one occasion urged that there should be a differentiation in the work of the section, and the society. Perhaps the easier plan is to make the meetings of the society "program" meetings, in which papers are read by invitation, while in the section we still allow practically any one to read almost any kind of a paper on nearly any subject in any way connected with botany. It is quite absurd to have two botanical organizations with no other difference than that of name and presiding officers. The writer holds that the section should always be maintained as a democratic body of botanists, before which one may volunteer to bring a paper. It must be maintained for the benefit of the young men who are constantly joining the ranks of the botanists. Here is where as strangers they may appear with papers which show their ability, or lack of it. Here, too, the older and more experienced men may read their less technical papers, and those whose purpose is more that of instruction, and the promotion of general discussion. Methods of teaching, the popularizing of botany, its applications in the arts and industries, and in fact anything which may advance this department of science, may certainly be included in the work of the section.

Possibly a practicable method for beginning the differentiation of section and society would be to have a joint committee on papers, to which all papers for either organization should be submitted. Such committee should be given the power to sort the papers, and to assign them to section, or society, for reading, in accordance with an agreed plan. The difficulty with this proposal is that such a committee can not meet personally before the meetings, and that the papers (or abstracts) are not to be secured long enough in advance of the meetings for the matter to be attended to by correspondence. However, if for the coming meeting every paper (or a good abstract) could be in the hands of such a joint committee by Monday morning, December 30, at 9 o'clock, it would not be a difficult task to make such an assignment as would differentiate the two organizations quite sharply.

For the present the society is preparing programs for at least a part of its sessions, and participation in these programs is by invi-

tation. This is a good beginning, and should be followed by action on the part of the society and the section which will continue and extend it.

SHORT NOTES ON RECENT PAPERS

AN interesting and useful hundred-page pamphlet entitled "London Botanical Gardens," by Pierre E. F. Perrédès, is published by the Wellcome Chemical Research Laboratories, of London. In addition to the descriptive text it includes thirty-one full-page plates, mostly reproductions of photographs.

Among recent papers by Professor Doctor A. J. Ewart, the government botanist for Victoria, Australia, are "The Function of Silica in the Nutrition of Cereals," "Contributions to the Flora of Australia" and "The Movements of the Soluble Constituents in Fine Alluvial Soils."

J. G. Luehmann's "Dichotomous Key to the hitherto known Species of Eucalyptus," although read before the Australasian Association for the Advancement of Science nearly ten years ago, is worthy of mention now, as being most useful to persons interested in this genus of trees, as must be the case especially with our Pacific coast botanists.

"The Leguminosae of Porto Rico," by Miss Janet Russell Perkins, published as Part 4 of Volume X. of the Contributions from the United States National Herbarium, is a well-written and very interesting paper of almost ninety pages. The "local names" given for most of the species, must prove very useful to American residents or others who are interested in the botany of the island. A complete manual prepared after this model would be a most useful work.

Shortly after the death of Dr. Otto Kuntze a catalogue was made of his extensive herbarium, which is now offered for sale. It is contained in 467 cardboard boxes, and probably includes between twenty and thirty thousand specimens. Further information may be obtained by addressing "Villa Girola, San Remo, Italy."

Six papers have been received in advance of their publication in the Eighteenth Annual Report of the Missouri Botanical Garden, viz.: "The Literature of Furcraea with a Synopsis of the known Species," by J. R. Drummond; "Branch Cankers of Rhododendron" and "Frost Injuries of Sycamore Buds," by Hermann von Schrenk; "Plantae Lindheimerianae, part III.," by J. W. Blankinship; "Additions to the Genus *Yucca*" and "*Agave macroacantha* and allied Euagaves," by Dr. William Trelease. Most of these are contributions to our knowledge of Mexico and southwest United States botany, in continuation of similar work which has hitherto come from the Missouri Botanical Garden.

While there is no formal botany in the "Proceedings of the Iowa Park and Forestry Association" attention may be called to it here on account of its interest in the planting and preservation of trees, and the unusual beauty of illustrations, paper and presswork shown in this state report.

In the November number of the "Journal of Botany" there appears a portrait and an appreciative sketch of the life and work of the late Edward A. L. Batters, an English botanist, and well-known student of the marine algæ.

In the number of the "Berichte der deutschen Botanischen Gesellschaft" for August 28, A. B. Reagan publishes a list of plants observed on the Rosebud Indian Reservation of South Dakota, which contains so many obvious errors and omissions, as to give a wholly erroneous idea as to the flora of the country. This reservation is in the extreme southern portion of the state, adjoining Nebraska on the south, and lying on both sides of the one-hundredth meridian west of Greenwich. The flora of this part of the Great Plains has been pretty well known to western botanists for a decade or more, and yet we are asked to believe that *Vitis æstivalis, Rhus copallina, Rosa humilis, Rosa rubiginosa, Fraxinus americana, Quercus obtusiloba, Populus heterophylla* and *Pinus banksiana* occur in the region. These are certainly erroneous determinations. In passing we may enter a protest against such a nomenclatural monstrosity as *Prunus rosebudii,* which is proposed for what the author takes to be a new species of sand cherry.

CHARLES E. BESSEY
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THE BIOLOGICAL SURVEY[1]

The Biological Survey is quietly working for the good of our agricultural interests and is an excellent example of a government bureau which conducts original scientific research, the findings of which are of much practical utility. For more than twenty years it has studied the food habits of birds and mammals that are injurious or beneficial to agriculture, horticulture and forestry; has distributed illustrated bulletins on the subject and has labored to secure legislative protection for the beneficial species. The cotton-boll weevil, which has recently overspread the cotton belt of Texas and is steadily extending its range, is said to cause an annual loss of about $3,000,000. The Biological Survey has ascertained and given wide publicity to the fact that at least forty-three kinds of birds prey upon this destructive insect. It has discovered that fifty-seven species of birds feed upon scale insects—dreaded enemies of the fruit-grower. It has shown that woodpeckers as a class, by destroying the larvæ of wood-boring insects, are so essential to tree life that it is doubtful if our forests could exist without them. It has shown that cuckoos and orioles are the natural enemies of the leaf-eating caterpillars that destroy our shade and fruit trees; that our quails and sparrows consume annually hundreds of tons of seeds of noxious weeds; that hawks and owls as a class (excepting the few that kill poultry and game birds) are markedly beneficial, spending their lives in catching grasshoppers, mice and other pests that prey upon the products of husbandry. It has conducted field experiments for the purpose of devising and perfecting simple methods of holding in check the hordes of destructive rodents—rats, mice, rabbits, gophers, prairie-dogs and ground-squirrels—which annually destroy crops worth many millions of dollars; and it has published practical directions for the destruction of wolves and coyotes on the stock ranges of the west, resulting during the last year in an estimated saving of cattle and sheep valued at upward of a million dollars.

It has inaugurated a system of inspection at the principal ports of entry on both Atlantic and Pacific coasts by means of which the introduction of noxious mammals and birds is prevented, thus keeping out the mongoose and certain birds which are as much to be dreaded as the previously introduced English sparrow and the house rats and mice.

In the interest of game protection it has cooperated with local officials in every state in the union, has striven to promote uniform legislation in the several states, has rendered important service in enforcing the federal law regulating interstate traffic in game and has shown how game protection may be made to yield a large revenue to the state—a revenue amounting in the case of Illinois to $128,000 in a single year.

The Biological Survey has explored the faunas and floras of America with reference to the distribution of animals and plants; it has defined and mapped the natural life areas—areas in which, by reason of prevailing climatic conditions, certain kinds of animals and plants occur—and has pointed out the adaptability of these areas to the cultivation of particular crops. The results of these investigations are not only of high educational value, but are worth each year to the progressive farmers of the country many times the cost of maintaining the survey, which, it may be added, is exceedingly small. I recommend to congress that this bureau, whose usefulness is seriously handicapped by lack of funds, be granted an appropriation in some degree commensurate with the importance of the work it is doing.

[1] President Roosevelt in his annual report to the congress.

FIELD MUSEUM OF NATURAL HISTORY[1]

The Field Museum is open to the public from 9:00 A.M. until 4:00 P.M.; visitors within the museum may remain until half-past four. The badge of the association admits members to the museum during the meeting. The museum is situated in Jackson Park at the continuation of 57th Street; is five minutes'

[1] Information for visitors attending the convocation week meeting.

walk from the Illinois Central Station, 57th Street, and ten minutes' walk from the University of Chicago.

The location of the offices of the building is as follows: the director's office is at the southeast corner of the South Court; anthropology, east end of East Court gallery; botany, north end of North Court gallery; geology, in halls 73 and 74; zoology, southwest corner of the West Court; the printing office is at the top of the west end of the West Court, and the section of photography, at the top of the east end of the East Court; the taxidermist's shop is at the northeast corner of the main structure, entrance to which is through hall 7.

The museum comprises four departments: Anthropology, Botany, Geology and Zoology.

The DEPARTMENT OF ANTHROPOLOGY occupies the entire eastern half of the building. It may be most easily visited by pursuing the following plan: On entering the museum at the main door one finds oneself in the North Court, where is installed the exhibits of classified archeology from Italy and prehistoric archeology from Europe. The most remarkable specimens in the court are to be found in the south end of the court, where are exhibited several interesting Etruscan tombs as well as the contents of several trench tombs, and the mural decorations of bronze bath tubs from the Villa of Bosce Reale on the east side. From the North Court one may pass through the reading room—hall 28—to hall 34, devoted exclusively to archeology. From hall 34 one should proceed to examine halls 30 and 31, and pass from hall 30 into the West Court where the collections illustrating the tribes of the Caddoan Stock may be seen in alcoves 1, 6, 7 and 8. From the West Court one may proceed to the South Court and examine the Tlingit collection in the alcoves on the east side and enter room 10, continuation of the Tlingit collection, and examine the collections of the northwest coast, which are found in halls 10, 11, 12, 13, 14, 15. Halls 16 and 17 represent the ethnology of the Hopi of Arizona and are of special interest on account of the life-sized reproduction of many important religious articles. From 17 one passes into hall 18 devoted to ethnology of the tribes of the plains. The East Court may next be visited by passing through hall 12. The East Court is devoted exclusively to archeology, the alcoves on the south being devoted to South American archeology, those on the north side to North American archeology. The cases in the center of the court are devoted to Mexican and North American archeology. In alcove 83 of this court is to be found the remarkable collection from Hopewell group of earth works in Ross Co., Ohio. Of special interest are the implements and ornaments of copper and meteoric iron, carvings in bone, stone and mica; large obsidian knives of unusual size, and a cache of over 7,000 flint implements of rough form. In this court is also found a remarkable series of large carvings from the North Pacific Coast, chiefly from Haidas and Kwakiutl, and from the East Court one enters through alcove 82 to hall 3, devoted to the ethnology of the Columbia River tribes, of special importance being a series of stone carvings from near The Dales; hall 4 is devoted to the Eskimo, hall 5 to Arapaho and Cheyenne and hall 6 to the Non Pueblo of the southwest. Passing through hall 9 one enters hall 8, containing the prehistoric collections from Arizona and New Mexico. To the east of hall 8 is the East Annex, temporarily closed to the public, but admission will be given those especially interested. In this section is being installed the ethnological collections from Asia, Africa and the Islands of t' e Pacific. The provision and assignment of halls is as follows: Halls 37, 38, 39, 40 and 55—Indonesia; 54—Polynesia; 53—Melanesia and Micronesia; 52, 51 and 50—Africa; 56, 57, 58 and 41—Asia; 49—Physical Anthropology. A temporary exhibition of skulls and skeletons, illustrating certain phases of anthropology, are to be found on the south side of the gallery of the East Court. From the East Court, or from hall 8, one returns to the North Court, passing through hall 9, which is devoted to the archeology of Egypt. This collection contains a large number of interesting and well-preserved coffins, a large series of mortuary stellæ, an interesting mortuary cedar boat about 4,500

years old, many large pieces of bronze, and a very rare sistrum. Objects of gold or those containing precious stones, including those from Peru, Bolivia, Ecuador, Columbia, Italy, Egypt and India, are found in hall No. 32, which may be entered from the West Court.

The Department of Botany occupies the galleries of the North, South, East and West Courts of the main building and may be reached by any of the four flights of stairs near the central rotunda, or by the stairs at one side of the east and west main doorways. The department is now being reinstalled. The old geographic arrangement, established in the beginning, is being replaced as rapidly as possible by a consecutive, systematic series; the early installation being on that account in a more or less chaotic and depleted state need not be visited.

The visitor should ascend the left stairway at the rotunda and on reaching the top of the stairs bear to the right to the transept gallery. Case I. begins the systematic installation with the Pines (9 cases), followed to the right by the Cycads, Typhaceæ, etc. The grasses (15½ cases) begin with a very interesting series of bamboos (3 cases) and end with a complete illustration of maize in all its forms and products (the door at this point leads to the herbarium). Bear to the right past the Cyperaceæ and the Palmæ (11 cases), noting the large and interesting series devoted to the Cocoanut; again to the right, following through the various orders (9 cases); to the Oaks (3 cases). Pass th ough the archway ahead containing the Moraceæ, etc. (5 cases) and bear to the right across the transept (6 cases Linaceæ). Bear again to the right through the archway (3 cases Urticaceæ) and turn to the right across the transept (Leguminosæ—5 cases), noting the large amount of products and interesting fruits of this order to the Laurels and Sumacs at the end of the transept. Again bear to the right through the transept arch to the Rubiaceæ, noting the complete installation of coffee, and still bear to the right along the transept (11 cases) to the Malvaceæ (4 cases), noting the exhaustive installation of cotton, illustrating its history and uses. To the right are two cases: the Tiliaceæ to Oleaceæ, then turn to the left to view the 7 cases, so far installed, containing the dendrological series, noting particularly the very exhaustive illustration of the timber products of Japan.

The curator's office and the herbarium are immediately above the main entrance to the museum. The most interesting feature of the herbarium, beyond its valuable collections of 250,000 sheets, is the systematic catalogue of every collection composing it. It is probably the only herbarium extant in which the series of plants of any collector can be reassembled for study at any time.

The collections of the Department of Geology occupy chiefly the West Annex of the building. They may be reached from the West Court or by turning to the right upon entering the building and passing through the reading room and hall 34. From the West Court, hall 32, containing a remarkable collection of gems and jewels, should be noted. The next six halls passing westward are devoted to paleontology. These are arranged in stratigraphic order, passing from Paleozoic to Genozoic. Hall 33 contains the Paleozoic fossils, also series illustrating the mode of origin of fossils and comparative forms. Hall 35 is at present closed. Hall 36, devoted to Mesozoic fossils, contains, among other notable specimens, the largest skull of Triceratops, a great horned lizard, that is known. A femur of Brachiosaurus, also shown here, is probably the largest single bone ever discovered. In hall 59 may be noted an excellent series of Ichthyosaurus remains, one of the most perfect skeletons of a flying lizard ever discovered, and a representative series of White River mammals. The problematic Dæmonelix is shown in hall 60, and in hall 61 the extensive series of Titanotherium remains and a complete skeleton of Promerycochœrus are worthy of especial note.

The next hall, 62, contains the collection of meteorites, which is one of the largest in the world. It contains representatives of 300 falls, some of them complete. Perhaps the most important specimen is the meteorite of Long Island, Kansas, over 1,100 pounds of which are shown and which is the largest

single stone meteorite known. The two following halls, 63 and 64, are devoted to the systematic mineral collection. The mode of installation employed here is especially designed with a view to the best display of the specimens and to permit a study of their more minute features. The larger specimens are shown in the wall cases. Series of special importance are the quartzes, calcites, barites and wulfenites. The radioactive minerals are illustrated by specimens and photographs. Several hundred specimens of cut gems and ornamental stones are shown in hall 64.

The Hall of Structural Geology, hall 65, contains a case illustrating cave formations and cave life, the cave formations being mounted in natural positions. The specimens of ripple marks, septaria and concretions shown in this hall are of special interest. Hall 66, devoted to lithological collections, is at present undergoing reinstallation, as is also the adjoining hall, 67. Clays, soils, sands and cements occupy hall 68, the different varieties being fully illustrated and their technical varieties shown. The large plate glass map in hall 69 shows the distribution of coal in the United States. Varieties of coals and hydrocarbons occupy hall 70, and petroleum in its varieties, origin and uses is shown in hall 71. Ores of the precious metals and lead in typical occurrences from various localities of the world are shown in hall 72. The statistical column in the West Dome shows the bulk of the different products of the mines of the United States for each second of time during the year of the World's Columbian Exposition. The ores of the base metals in great variety and completeness occupy hall 79. The specimens of Arkansas zinc, ore and Canadian nickel ore here shown are of remarkable size. Returning through the West Dome, halls 76 and 77, devoted to geographical exhibits, will be reached, the collections consisting chiefly of a series of relief maps illustrating important geographical and geological regions. Hall 78 contains collections of salts, abrasive, refractory materials, etc., gathered with a view to their economic uses and interest. The curator's office and the chemical and paleontological laboratories are located in the southwest corner of the Annex, and can be reached from hall 76. Material, which may be desired to be studied, in addition to that exhibited, may be seen in part in these laboratories and in part is stored in the exhibition halls.

To visit the DEPARTMENT OF ZOOLOGY one should pass through the North Court to the rotunda and turn to the right to the West Court, which contains many groups of large mammals mounted by Mr. C. E. Akeley. Among the most important of these are the following: the hunting leopard, Beisa antelope, Swayne's hartbeest, orang-outang, striped hyena, and great koodoo, spotted hyena and Waller's gazelle. From the West Court one may pass to the South Court, which contains additional groups mounted by Mr. Akeley, the most important being that of the white-tailed, or Virginia, deer, which is probably unique. The South Court also contains a group of mountain sheep and polar bears. The court also contains the collection of Mollusca, which represents fairly well the subject of conchology. From the South Court one passes into hall 19, which, with hall 20, contains the systematic collection of Mammalia. Hall 22 is devoted to fishes and reptiles. Hall 23 and the adjoining alcove 97 of the East Court is devoted to the osteological collection consisting of mounted skeletons of over 225 species. Hall 24 is devoted to sponges, jelly fish, corals, etc. Halls 25 and 26 are occupied by mounted birds, there being represented about 550 species; the arrangement is systematic. Hall 27 is devoted exclusively to Illinois birds and their eggs. The study collection of birds, numbering about 40,000 specimens, is in the gallery of hall 27. The storage collections in entomology number about 70,000 specimens and are to be found in the gallery of the South Court, which also contains the study collections comprising about 20,000 specimens, representing all the most important species of North American mammals.

NORTHWESTERN UNIVERSITY

THE departments of Northwestern are widely scattered and therefore fail to make the impression they would if they were all together. The College of Liberal Arts, the

oldest department of the institution, is in Evanston, about ten miles north of the business center of Chicago. The campus extends half a mile along the shores of Lake Michigan, and is well worth seeing. The important buildings on it are the main University Hall, the Orrington Lunt Library, the Dearborn Observatory, the School of Music, Science Hall, the Garrett Biblical Institute and the School of Oratory. Ground has been broken for the buildings to house the new Department of Engineering, from which much is expected.

Northwestern University Building is a large six-story structure in the center of the business district of Chicago, in which are located the Schools of Law, Dentistry and Pharmacy. These departments are remarkably well equipped, and in reputation rank second to none in the country. The library of the law school is worth a visit, not only because of its collections of books, but also on account of the unique construction.

The Medical School is located on Dearborn street between 24th and 25th, in the vicinity of the important hospitals, Mercy and Wesley. The medical school is well known throughout the country on account of the position it took years ago on the question of graded medical instruction, and required laboratory work, and with the general advance has maintained its relative rank. This department is easily reached by the state street cars from down town.

THE UNIVERSITY OF CHICAGO

To American men of science the University of Berlin, the University of Leipzig, or the University of Munich connotes no collection of buildings but the published writings of men who in the laboratories of these institutions have achieved their results. To Europeans the name of the University of Chicago suggests, not high-raised battlements and towers, but the men who there carry on their scientific work. Those attending the exercises of convocation week, knowing the university as do the Europeans, will be interested also in observing the habitat of these men whose work they know.

As one stands at the west end of the Midway Plaisance and looks eastward almost a mile he sees to the north and the south of this beautiful thoroughfare the campus of the university; north, there confronts him the earliest building, Cobb Hall and the dormitories straggling to the south of it. Cobb is a recitation building housing the classical departmental libraries and the library of the modern language group, as well as most of the administrative offices and an information office. East of Cobb is Haskell Oriental Museum, on the top floor of which there is the library of the Divinity School; on the second floor, some valuable Oriental collections, including those in Biblical history, Comparative Religion, Assyrian and Egyptian life, and the work of the Oriental Exploration; on the first floor, the faculty room and the office of the president. As one leaves the east door of Haskell he gazes upon the tall windows of the Law Building, a structure modeled somewhat on the King's College Chapel at Cambridge, though the mitre-like towers are somewhat shortened and the buttresses lack the graceful English finials. The first floor of the Law Building is given over to large lecture rooms, to be used for many of the section meetings. Up the massive stairway one goes to the great reading room, a hall with high timbered ceiling, 160 feet long and 50 feet wide. South of the Law Building and Haskell will be erected the William Rainey Harper Memorial Library, extending with its two wings from the men's halls on the west to the women's halls on the east. Those interested in the housing of women in the university will do well to call for a moment at Nancy Foster Hall, the most southerly of the four women's halls, before passing north of the women's quadrangle to Walker Museum. As one stands in front of Walker he can see immediately to the east the Quadrangle Club at the corner of Fifty-eighth and Lexington, and just south of it a temporary recitation building for women called Lexington Hall wherein luncheon will be served during the convocation. Two blocks to the east are the structures of the School of Education, including the University High

School, the University Elementary School, and the College of Education. Here, too, some of the meetings will be held and here likewise luncheon can be secured. Westward beyond Cobb Hall one sees a structure like Lexington Hall erected as a temporary recitation building for men. Here may be found the campus headquarters of the Astronomical Department though the departmental library is in Ryerson Laboratory. Just north of Ellis stands at the corner of Ellis and Fifty-eighth a red-brick structure, the Press Building. Here for the present are the business offices, the general library and the university press. The last-named division of the university has charge of all printing and publishing for the institution and of the purchase and distribution of books and supplies. The list of published books numbers about 375. Last year thirty-three books were issued. Fourteen journals are printed at regular intervals. The function of the press and the attitude of the university toward the same are things worthy of attention. And beyond the Press Building is the power house whence come the heat and light and filtered water for all of the thirty-odd structures.

Having taken this survey of a miscellaneous group of buildings of minor importance to scientists the visitor will desire to enter the building where Professor Chamberlin and his colleagues do their work. The collections in Walker are estimated to embrace over one million specimens, including the general geological, the anthropological, and the paleontological collections. The general geological collection contains material illustrating structural phenomena, fossils, geographical material, economic geology, mineralogy and petrography. In addition to the anthropological collection of ethnographic archeologic material there are the Ryerson collections in Mexican archeology and from the cliff-dwellings and cave houses of Utah, the Clement collection from Japan, and the material collected by Professor Starr among the Ainu of Japan and the native tribes of the Congo Free State. The paleontological collection of invertebrates contains a large amount of material, especially from the Paleozoic horizons. Here also are the collections of Hall, Gurley, James, Washburn, Krantz, Weller, Sampson, Faber, Bassler and Van Horne. The collection of vertebrate fossils includes extensive series of the American Permian reptiles, Triassic reptiles and amphibians, Niobrara Cretaceous birds, reptiles and fishes, with a considerable material from the Laramie Cretaceous and White River Oligocene.

Across the campus are the first two laboratories erected. Kent Chemical Laboratory was erected in 1893. The basement contains a furnace room for crucible work, muffle work, tube-heating, and other purposes; a constant temperature room, a room fitted with steam and other appliances for work on a large scale, a mechanical workshop, and storage-rooms. On the first floor are one small and two large lecture rooms, and a large lecture hall seating three hundred persons, fitted for use as a chemical lecture room, if desired. This floor also contains a chemical museum, a large private laboratory, a room with northern exposure, especially fitted for use as a gas-analysis laboratory, and also apparatus and preparation rooms connected with the lecture rooms. On the second floor are two large laboratories for research and quantitative analysis; three private laboratories for the professors; balance, combustion, and air-furnace rooms; a balcony for out-of-door work; and the chemical library. On the third floor are three laboratories for general and analytical chemistry, a storeroom, a preparation room, a room especially fitted for optical and photographic work, a balance room, and two private laboratories.

East of Kent is the Ryerson Physical Laboratory. The central part of the fourth floor forms a hall for experiments requiring a large space. The roof above this portion is flat and suitable for observations in the open air. The third floor is devoted to a general laboratory for the undergraduate work in general physics, which with its adjoining apparatus and preparation rooms occupies the entire floor of the east wing. On the same floor are found two general laboratories and class rooms. On the second floor are found a large

general laboratory for advanced undergraduate work, optical laboratories, a chemical laboratory, a large dark-room, two developing rooms, and the large lecture hall with its adjoining apparatus and preparation rooms. The first floor is devoted to laboratories for research. Two large constant temperature rooms and the mechanician's room where all tools and appliances necessary in the construction or repair of physical apparatus are stored are here. In the small room in the southeast corner Michelson carried on the experiments which have won for himself and American scholarship the great honor of the Nobel prize.

As one passes north between Kent and Ryerson he enters Hull Court surrounded from left to right by the Physiology, Anatomy, Zoology and Botany Buildings. In the first Loeb and Stewart did their work; in the second, Barker and Donaldson and Herrick; in the Zoology Building, Whitman and his colleagues; and in the structure to the right, Coulter and the other botany men make use of the material from as near at hand as in the pond beside their windows or from as far away as Mexico, the Yukon and Java. Hull Court is the center for the men preparing to take up medicine. Here is found the effort to link the work of the medical college to that of the university in the way so forcefully advocated by the retiring president of the association.

As one passes through Hull Court he will do well to turn for a moment to the west and look at least into the library of Hitchcock Hall, one of the men's dormitories, before passing eastward to Hutchinson Court and the magnificent Tower Group of buildings. The rich interior of the Leon Mandel Assembly Hall will become familiar to all attending the general meetings of the association. The Reynolds Club, reminding one somewhat of St. John's at Oxford, is entered from the cloister. On the first floor, north of the elaborate Elizabethan stairway, is the library; to the south, the billiard room. On the second floor, in addition to several committee rooms, is a large reception room. On the third floor, in addition to other committee rooms, is a small theater with trusses of open timber and an interesting stage curtain representing a fête day in a medieval town. These decorations, indeed, all the decorations in the Tower Group, are by Mr. Frederick Bartlett, of Chicago. The basement contains bowling alleys and a barber shop. The Reynolds Club serves that function in the University of Chicago which the Houston Club serves at Pennsylvania and the Union at Harvard. Hutchinson Hall is a replica of Christ Church Hall at Oxford. The main entrance is through a large arch at the base of the tower. The great room is forty feet wide, one hundred and fifteen feet in length. About the oak wainscoting with its series of shields of British and American Universities rise delicately traceried windows and, higher still, at least fifty feet from the floor, are magnificent trusses of open timber work from which hang beautiful pendant lanterns of oak decorated in red, blue and gold. At the west end of the room hang the portraits of the founder of the university, a picture by Eastman Johnson; of President Harper, a portrait painted by Gari Melchers; and the President of the Board of Trustees, Martin A. Ryerson, a painting by Lawton S. Parker. On the south wall are a small portrait of Silas Cobb and a picture by Frederick Vinton of Professor Galusha Anderson. At the east end of the room hangs a picture of the first head of the History Department, Professor von Holtz, painted by Karl Marrof Münich. On the north wall is a likeness of the president of the university, painted by Lawton Parker. Leaving the tower one will desire to look into the Frank Dickinson Bartlett Gymnasium, particularly at the mural decorations by the brother of the young man for whom the building is named, the window presented in his memory by Mr. William G. Hibbard of his father's firm, and the large exercising floor of the gymnasium.

After one has surveyed the many buildings of the university and at the gymnasium stands thinking of the material resources of the institution, of the fact that although most of the $27,590,994 was the contribution of one man, the citizens of a sister city, twenty-three

of the twenty-eight permanent buildings were presented by citizens of Chicago, and the number of donors is upwards of 3,000, most of them Chicagoans, he should realize on looking south toward the Chicago copy of the Magdalen Tower, the beautiful edifice whence soon will ring the chimes in memory of the gracious first Dean of Women, Alice Freeman Palmer, that a genuine appreciation of the men who make the connotation for the buildings possesses the singer of the university song:

> The City White hath fled the earth,
> But where the azure waters lie,
> A nobler city hath its birth,
> The City Gray that ne'er shall die.
> For decades and for centuries,
> Its battlemented tow'rs shall rise,
> Beneath the hope-filled western skies,
> 'Tis our dear Alma Mater.

DAVID A. ROBERTSON
UNIVERSITY OF CHICAGO.

LOCAL ARRANGEMENTS FOR THE CHICAGO MEETING

To those who intend attending the fifty-eighth meeting of the American Association for the Advancement of Science at Chicago, from December 30 to January 4, and have never been in the City-of-the-Lake, it may be well to mention that Chicago does not lie at the southern extremity of Lake Michigan, as many maps indicate, but on its western shore; and that therefore to become properly oriented in the city one should remember that the lake lies to the east, not to the north. To those who were so fortunate as to be able to visit the great world's fair it will be sufficient to state that the campus of the University of Chicago, the meeting place, lies on the north side of the Midway Plaisance at about the center of its extent. The Midway is now returned to its former estate, that of a broad parkway uniting Jackson Park, in which the fair was held, to Washington Park, a mile to the west.

It is the aim of the local committee of the association to locate the meeting places, both of the various sections of the association and of the affiliating societies, as contiguous as possible, in order that no time may be lost nor confusion occur. To this end the university has placed all its lecture halls in the various buildings at the disposal of the association, and provision has been made whereby those in attendance at the meeting may secure luncheon without leaving the compus.

While the Auditorium Annex will be the headquarters of the association, it may be suggested for the information of those who may wish hotel accommodation near the campus that the Del Prado Hotel, Fifty-ninth Street—Madison Avenue and the Midway (60th Street Station, Illinois Central R. R.)—adjoins the campus on its eastern end; the Windermere Hotel (57th Street Station, Illinois Central R. R.) is at the north end of Jackson Park within easy walking distance; and the Chicago Beach Hotel (50th Street Station, Illinois Central R. R.), while somewhat farther away on the lake shore north of Jackson Park, is still within fair distance of the university. Those who intend locating in the city itself will find hotels and rates detailed on page 15 of the Preliminary Announcement of the meeting. They will note that the readiest method of reaching the meeting place will be *viâ* the Illinois Central Suburban Railway from the station on the Lake Front nearly opposite the Auditorium and Annex Hotels, on Michigan Avenue. The trains are frequent, the expresses making the run south to Fifty-seventh Street in twelve minutes. On arriving at this station (the second stop of the express trains) the lake and the Field Museum of Natural History will be in view to the east and the tower of the university to the west. Leave the station in the direction the train continues and on reaching the exit turn to the right. A 'bus may be taken to the campus or the short distance walked in a few minutes. The main entrance to the tower arcade, directly beneath the tower itself, brings the visitor immediately to the registration desk, the information bureau and the general headquarters of the association, from which each of the halls of meeting may be readily reached.

SCIENTIFIC NOTES AND NEWS

IN accordance with the desire of the Royal Society, Lord Kelvin was buried in West-

minster Abbey on December 23. The last man of science buried in the abbey was Charles Darwin, who died in 1882.

Professor Simon Newcomb, of Washington, and Professor Emil Fischer, of Berlin, have been elected foreign members of the Göttingen Academy of Sciences.

The freedom of the city of Glasgow will be conferred on Lord Lister.

The Lavoisier medal of the Paris Academy of Sciences has been awarded to Professor Adolf von Baeyer, of Munich, eminent for his work in organic chemistry and especially for the synthetic production of indigo.

The Lalande prize of the Paris Academy has been awarded to Mr. Thomas Lewis, of the Royal Observatory, Greenwich, and secretary of the Royal Astronomical Society. *The Observatory* states that during the last twenty years there have been twenty-one recipients of this prize, of whom nine were American, nine French, one South American, one Italian and (the present award) one Englishman.

The Wilde medal of the Manchester Literary and Philosophical Society has been awarded to Professor J. Larmor, of Cambridge. Professor Larmor will deliver on March 3 the Wilde lecture on "The Physical Aspect of the Atomic Theory," and at that time the medal will be presented.

A portrait of Dr. Arthur J. Evans, keeper of the Ashmolean Museum, Oxford, has been presented to the university by a number of those interested in archeology, including fifty-five American subscribers. The portrait, which is the work of Sir William B. Richmond, R.A., depicts Dr. Evans in the ruins of the Palace of Knossos.

Among those who have promised to deliver addresses before the International Congress on Tuberculosis, to be held at Washington from September 21 to October 12, 1908, are Dr. R. W. Philip, of Edinburgh; Dr. Theodore Williams, of London; Dr. Newsholme, of Brighton; Dr. C. H. Spronck, of Utrecht; Dr. Karl Turban, of Davos Platz; Dr. Gotthold Tannwitz, of Charlottenburg; Professor von Behring, of Marburg, Professor Calmette, of Lille; Dr. Maurice Letulle, of Paris; and Professor Kitasato, of Tokyo.

Professor J. C. Kapteyn, of the University of Gröningen, will hereafter spend several months of each year at the Solar Observatory of the Carnegie Institution on Mount Wilson.

Dr. Strömgren, of Kiel University, has been appointed director of the Copenhagen Observatory, in succession to Professor Thiele, retired.

According to *The Observatory*, M. Stephan is about to retire from the directorship of the Observatory of Marseilles. The selection of the occupant of such posts is entrusted to the Academy of Sciences, which selects two candidates to be presented to the minister of public instruction, the name of them being indicated as preferable. The selected candidates for Marseilles are M. Bourget and M. Simonin (given in this order). The candidates similarly submitted for the directorship of the Algiers Observatory, vacant by the death of M. Trépied, are M. Gonnessiat and M. Fabry.

Theodore Whittelsey, Ph.D., associate professor of chemistry in Northwestern University, has been granted leave of absence to serve as chemist of the department of investigation of the Continental-Mexican Rubber Company, which is engaged in the manufacture of rubber from guayule. Dr. Whittelsey will make a chemical study of the industrial possibilities of the plant life on a tract of land covering 2,500,000 acres that this company has recently purchased. His address is Hacienda de Cedros, Mazapil, Zacatecas, Mexico.

Mr. Walter E. Collinge has resigned the professorship of economic zoology in Birmingham University to accept the directorship of the Cooper Research Laboratory, Berkhamsted.

Mr. R. J. D. Graham, M.A., B.Sc., Carnegie scholar in botany, St. Andrews University, has been appointed to the Agricultural Department in India.

The University of Vienna recently conferred the medical degree on Count Vetter von der Lilie after he had completed the usual course. He is now fifty years old and has been prominent in political life, having served as president of the lower house of the Austrian parliament.

MESSRS. L. J. DE G. DE MILHAU and J. W. Hastings, who accompanied the South American expedition from the Peabody Museum, Harvard University, in 1906–7 as ethnologists, have returned to this country after a successful trip to the region of the Madre de Dios. Dr. Farrabee and Dr. Horr will continue the work in the field.

A MISSION under the command of M. Félix Dubois, the French explorer, which left Southern Oran in November, 1906, is now reported to have reached Gao, on the Eastern Niger. Its object is to study the Algerian and Saharan oases.

DR. J. COSSAR EWART, F.R.S., is this year giving the Swiney lectures on geology at the British Museum of Natural History. His subject is "Horses in the Past and Present."

INAUGURAL lectures were delivered by the Martin White professors of sociology at the London School of Economics, on December 17, by Professor L. T. Hobhouse on "The Roots of Modern Sociology" and by Professor E. A. Westermarck on "Sociology as a University Study."

PROFESSOR D. W. JOHNSON is giving a course of fifteen lectures on "The Physical Geography of the Lands," under the direction of the Teachers' School of Science, Boston. The lectures are given on Saturday afternoons, and are followed by laboratory exercises on the subjects discussed. The class at present numbers 156, of whom all but twelve are teachers in the schools of Boston and neighboring cities.

FREE illustrated lectures on legal holidays are to be delivered at the American Museum of Natural History, New York City, as follows:

Christmas Day, "Hiawatha's People," by Harlan I. Smith.

New Year's Day, "An Ornithologist's Travels in the West," by Frank M. Chapman.

Washington's Birthday, "Mines, Quarries and 'Steel Construction,'" by Louis P. Gratacap.

WITH the assistance of Yale University, and at the initiative of the Connecticut Academy of Arts and Sciences, the publication is planned of a volume of several hundred pages illustrating the collection of prehistoric relics obtained by the late Professor O. C. Marsh, and gathered in the province of Chiriqui, Panama. There will be some seven hundred illustrations, on which draughtsmen from New York are already at work, besides a set of chromolithographs made in Germany. George Grant MacCurdy, Curator of the anthropological section of Peabody Museum, will prepare the volume.

PROFESSOR ALFONSO SELLA, who held the chair of experimental physics in the University of Rome, died on November 25, at the age of forty years. He was known for his work on the Röntgen rays and radioactivity and as one of the principal leaders establishing the Italian Association for the Advancement of Science, which held its first meeting at Parma last September. A marble bust of Professor Sella will be erected in the Physical Laboratory at Rome.

THE east wing of the Museum of the Brooklyn Institute was formally opened to the public on Saturday, December 14. This wing completes the north front of the building, which has a length of a little more than 500 feet. The first and third floors of the east wing are devoted to art. The ground floor contains work rooms. The basement will contain the library, map collections, herbarium and some offices. The second floor will be used for the display of minerals and invertebrates. Owing to lack of cases this floor is at present only partially filled; its contents include a portion of the Ward collection of sponges and corals, the collections illustrating the difference between the faunas of temperate and tropical seas and a part of the collection of insects. There is sufficient material now in storage or in the hall to fill the entire second floor as soon as cases are provided.

IT is announced that Mr. Emile Berliner, of Washington, one of the perfectors of the telephone and the inventor of the gramophone, has given $12,500 as endowment of a research fellowship for women who have demonstrated their ability to carry on research work in physics, chemistry or biology. The foundation, which is in honor of the donor's mother,

will be known as the Sarah Berliner Research Fellowship for Women. The award will be made by a committee of women, of which Mrs. Christine Ladd Franklin, of Baltimore, is to be the chairman.

English exchanges state that the annual meeting of the British Science Guild will be held at the Mansion-house, January 15. The Lord Mayor has consented to preside and to become one of the vice-presidents of the guild. It is hoped that Mr. Haldane, the president of the guild, and others will address the meeting. Steps are being taken by the guild to bring the proposals for legislation for the prevention of the pollution of rivers before many societies and local bodies.

A chemical laboratory has recently been established at Tananarivo in Madagascar. Besides purely scientific researches, it is intended for the analysis of foodstuffs and other purposes of practical importance.

The Journal of the American Medical Association states that the International Medical Association of Mexico, which was to have met at Monterey in November for its third annual congress, has been postponed until January 23–25, on account of the prevalence of dengue fever at Monterey. This association combines English-speaking and Spanish-speaking physicians on an equal footing, the programs and summaries being printed in both languages, the speakers using their mother tongue. Dr. J. S. Steele of Monterey, is the secretary of the congress, and he states that unusual interest has been manifested in the meeting this year.

At a meeting of the commonwealth cabinet at Melbourne, on December 2, the postmaster general announced his decision to call for tenders for wireless telegraphy installations at some half dozen places round Australia, including King Island, Tasmania, Rottnest Island, some convenient center on the northern coast, Port Moresby, and Yorke Peninsula. Tenderers are to sell their Australian rights to the commonwealth. Parliament has decided not to allow directly or indirectly the establishment of a private monopoly. The installations will be capable of receiving messages from passing steamers equipped with any of the recognized systems.

In the reorganization of the Bureau of Forestry, Philippine Islands, Major George P. Ahern, director, the work of the field force has been placed in two divisions, viz., the Division of Forest Administration, in charge of Forester H. D. Everett, and the Division of Forest Investigation, in charge of Forester H. N. Whitford. As the name implies, the Division of Forest Administration is in charge of all administrative work of the bureau, such as granting licenses, inspection of cuttings, applications for homesteads, etc. Practically all of the timber land of the Philippine Islands is government property, of which this division is the guardian. The work of the Division of Forest Investigation is to discover the forest resources of the islands, and to bring this information to the notice of the public. A detailed system of mapping has been inaugurated, which shows areas of commercial and non-commercial forest, grass and agricultural lands. Considerable portions of the islands have already been mapped, and the work is being pushed as rapidly as possible. Special tracts of land are being studied in detail for working plans, and botanical collections, including both herbarium and wood specimens are being made. Herbarium sheets show altogether 1,109 tree species in the islands. It is probable that with further investigation, this number will be increased to 1,600 or 1,800. The museum now contains about 3,500 wood specimens, representing nearly 350 different species, and including all of the principal timbers. It is hoped that within a few years the bureau will be able to show by maps the different types of vegetation of the islands; to locate the different tracts of timber, with an estimate of the stand, etc.; to know the silvicultural habits of the principal timber trees (nearly 100); and to increase the knowledge in general of the tropical forests of the Philippine Islands.

Sir William Ramsay gave the Aldred lecture before the Society of Arts on December 11, his subject being "The Emanation given off by Radium." According to the abstract

given in the London *Times* he said that the emanation, whether a compound or not, was certainly endothermic; if left alone, it changed and presumably decomposed with an almost incredible evolution of heat. A ton of it would boil away 200 pounds of water in an hour, and would serve as efficient fuel to warm a house, do all the cooking, and provide hot baths for a large family, not only during their own lives, but for about twenty generations, without much falling off. If the emanation were dissolved in water it produced another effect, also involving a loss of energy—it decomposed the water into oxygen and hydrogen. But in this way there was always produced a small excess of hydrogen over that required to combine with the oxygen. One hypothesis to account for this excess was that hydrogen, too, was one of the products of the decay of the emanation, though on the whole that was unlikely. At the same time, there was formed a trace of dioxide of hydrogen, though not enough, so far as he could judge, to account for the excess entirely. Further, on removing the oxygen and hydrogen, there was left neon, another of the inactive atmospheric gases discovered by himself and Dr. Travers in 1898. With the hope of accounting for the excess of hydrogen, he exposed a solution of sulphate of copper to the action of the emanation; the gases evolved contained argon, but no recognizable helium or neon. Some of the copper, too, appeared to have changed, for the residue of the liquid, after removing all copper from it, contained a small trace of the element lithium, a member of the sodium group, which was easily recognized by its spectrum. It was probable, though not yet proved, that the element sodium was also a transmutation-product of copper, because the residue, obtained by evaporating the copper-solution, deprived of copper, which had been treated with emanation, was more than twice as heavy as that obtained from untreated copper sulphate. It must be explained that these solutions were contained in glass bulbs, and that glass contained silicate of sodium; experiments were now in progress in which glass was excluded, the bulb used being constructed of silica, free from sodium. Now these results corroborated each other, in a certain fashion, and admitted of a provisional theory. The emanation was a very inactive gas, unattacked by any reagents. Now this was the characteristic of the argon group alone—namely, helium, neon, argon, krypton and xenon. Again, we knew a similar series, though a longer one, the first member of which was lithium and the second sodium, to which copper, silver and gold also belonged. It appeared possible, to say the least, that the emanation degraded, split, was transformed, or transmuted itself into helium, neon or argon, all members of the same natural group, according to circumstances; and that, similarly, copper might turn, under the enormous influx of energy brought to bear on its atoms, into lithium, sodium and potassium, all of which had smaller atomic weights than copper and all of which were usually classified in the same chemical group.

IN 1906, for the second time, the total value of the mineral production of the United States exceeded the enormous sum of $1,500,000,000. The exact figures for 1906 are $1,902,505,206 as compared with $1,623,928,720 in 1905, a gain of $278,576,486, or 17.15 per cent. This great increase in the total value of our mineral production is due to gains in both metallic and nonmetallic products, the metallic products showing an increase in value from $702,453,101 in 1905 to $886,110,856 in 1906, a gain of $183,657,755, and the nonmetallic products showing an increase from $921,075,619 in 1905 to $1,016,194,350 in 1906, a gain of $95,118,731. To these products should be added estimated unspecified products, including molybdenum, bismuth and other minerals, valued at $200,000. As heretofore, iron and coal are our most important mineral products, the value of the iron in 1906 being $505,700,000, and that of the coal $513,079,809. The fuels increased from $602,257,548 in 1905 to $652,398,476 in 1906, a gain of $50,148,298. The values of the mineral products of the United States in 1905 and 1906 are summarized by Dr. William Taylor Thom, of the United States Geological Survey, in an advance chapter from "Mineral Resources of the United States, Calendar Year 1906," which

will soon be ready for distribution by the survey. This summary includes two tabular statements that differ radically. Both give the value of the mineral products of the country in the years 1905 and 1906; but the products of the whole country in their first one gives the net value of the mineral marketable form, excluding all unnecessary duplication. The manufactured coke product, for instance, amounting in 1906 to 36,401,217 short tons, is excluded, as it is represented in the quantity and value of the coal used in its manufacture, which are included in the coal statistics. Similarly white lead, red lead, sublimed lead, zinc lead, litharge and orange mineral, whose average aggregate value for the last ten years has greatly exceeded $10,000,000, are not given in the table, the base from which they are made being included in the output of pig lead. The second table, however, under the heading of "Output and Value by States and Territories," gives the value of both the raw material produced in the region and of certain derivatives in their first marketable condition.

The Faculty of Medicine of Harvard University offers a course of free public lectures, to be given at the new buildings of the Medical School, Longwood Ave., Boston, Saturday at 8 P.M., and Sunday at 4 P.M., beginning January 4, and ending April 26, 1908. No tickets are required. Following is a list of the lecturers and their subjects, with dates:

January 4—"Some Recent Discoveries in the Physiology of Digestion" (illustrated by lantern slides and zoetrope demonstrations), by Dr. Walter B. Cannon.

January 5—"Human Gait" (illustrated by lantern slides), by Dr. Edward H. Bradford.

January 11—"The Modern Crusade against Typhoid Fever," by Dr. Elliott P. Joslin.

January 12—"Common Salt," by Dr. Lawrence J. Henderson.

January 18—"The Causes of Nervous and Mental Disease," by Dr. Philip Coombs Knapp.

January 19—"Fatigue: Its Effects and its Treatment," by Dr. George A. Waterman.

January 25—"Nervous Disorders of Children," by Dr. William N. Bullard.

January 26—"Nervous Breakdown during Adolescence and Adult Life," by Dr. James J. Putnam.

February 1—"Some of the Nervous Disorders of Adult Life, with Especial Reference to 'Habits,'" by Dr. Edward W. Taylor.

February 2—"Popular Fallacies regarding Insanity and the Treatment of the Insane," by Dr. Henry R. Stedman.

February 8—"Alcoholism and Insanity," by Dr. Charles P. Bancroft.

February 9—"The Ear and the Telephone," by Dr. Clarence J. Blake.

February 15—"The Interest of the Public in Surgical Progress," by Dr. James G. Mumford.

February 16—"The Sick Child," by Dr. Thomas Morgan Rotch.

February 22—"The Causes of Disease in Infants and Children," by Dr. Charles Hunter Dunn.

February 23—"Rational Infant Feeding," by Dr. John Lovett Morse.

February 29—"Syphilis: Its Nature and Dangers," by Dr. James C. White.

March 1—"Smallpox and Vaccination," by Dr. John Hildreth McCollom.

March 7—"The Problem of the 'Nervous Temperament' in Children," by Dr. George A. Craigin.

March 8—"Florence Nightingale and the Beginning of Surgical Nursing," by Dr. J. Bapst Blake.

March 14—"Modern Methods for the Care of the Insane" (illustrated), by Dr. Owen Copp.

March 15—"The Relation of the Hospital to the Community," by Dr. Abner Post.

March 21—"Mental Hygiene and the Prevention of Insanity," by Dr. George T. Tuttle.

March 22—"Psychic Treatment of Disease: Its Limitations and Uses," by Dr. Richard C. Cabot.

March 28—"What the People should know about Tumors. Prospects of Cure of Malignant Disease in the Light of Our Present Knowledge. Importance of Early Cooperation on the Part of the Laity," by Dr. Howard A. Lothrop.

March 29—"The Development and Maintenance of Good Teeth," by Dr. Charles A. Brackett.

April 4—"The Inflammations due to the Commoner Pus Germs: their Local and General Effects. Blood-poisoning," by Dr. Charles A. Porter.

April 5—"Certain Dangerous Popular Delusions concerning Grave Surgical Diseases," by Dr. Maurice H. Richardson.

April 11—"Foods in Health and Disease," by Dr. Maurice Vejux Tyrode.

April 12—"The Development of the Microscope," by Dr. Harold C. Ernst.

April 18—"Some Preventable Diseases of the Skin," by Dr. Charles J. White.

April 19—"The Relation of Animal Life to Human Diseases," by Dr. Theobald Smith.

April 25—"The Cocaine Evil," by Dr. Charles Harrington.

April 26—"Tumors," by Dr. William T. Councilman.

PROFESSOR ERASMUS HAWORTH, professor of geology in the University of Kansas, was elected president of the Kansas Academy of Sciences at its annual meeting held at Emporia on November 29 and 30. The academy will meet next year at Topeka.

PROFESSOR ARTHUR W. GOODSPEED, professor of physics in the University of Pennsylvania, is giving a series of lectures on scientific subjects in middle western cities.

PROFESSOR JOHN CRAIG, professor of horticulture at Cornell University, has been granted a leave of absence, and will spend several months in Europe.

THE *Yale Alumni Weekly* states that the senior class of the Forest School this year, as in the past four years, will spend the spring term in practical field work on a large tract of forest land. The classes of 1904 and 1905 were at Milford, Pa.; the class of 1906 was at Waterville, N. H., on the land of the International Paper Company, and last year the seniors spent three months in the Ozark Mountains near Grandin, Mo., on the J. B. White Lumber Company tract. The forest map and estimates which the class of 1907 made for this company proved so valuable that this year several lumber companies have applied to Professor Graves to have the senior class come and camp on their land. From among these offers the tract of the Caul Lumber Company in Coosa County, central Alabama, has been chosen as the location of the camp for the spring of 1908. This region is midway between the coastal plains and the mountains, in a rolling country where the forests of long-leaf pine and many other trees make a delightful field for forestry work. The students will live in a camp located at an elevation of about 800 feet above the sea, 25 miles from Hollins, Ala., and near a spur of the logging railroad. The work will be similar to that done last spring, including the making of a topographic map of the whole tract and estimating and describing all the stands of timber. There will also be abundant opportunity to study in detail methods of logging and railroad construction, and an interesting part of the work will be to devise a practical plan by which the tract can be managed with financial profit in such a way that reproduction of the most valuable species of trees can be secured, the young timber protected from fire, and a future yield attained. Part of the term will be spent in the mill and lumber yards at the town of Hollins, Ala., where the senior foresters will be instructed in saw-mill operations, grading and handling lumber and office management.

THE London *Times* notes that till within the last few years the African elephant was represented in British museums by very few specimens of small size. Of these the most noted was perhaps that sent home to Saffron Walden in the thirties of the nineteenth century by John Dunn, and mounted in amateur fashion by local naturalists. This was brought up to the Great Exhibition of 1851, and used to display the magnificent howdah and trappings presented to Queen Victoria by some Indian princes. Recently, however, matters have changed for the better. In fulfilment of a commission, Mr. Rowland Ward obtained and mounted the very fine Rhodesian animal, standing nearly 11 feet 6 inches high, and without doubt the largest museum specimen in existence, for the British Museum (Natural History), where it forms the most striking object in the Great Hall. The same naturalist has just forwarded to the Royal Scottish Museum, Edinburgh, an equally fine specimen, a little under that measurement, the tape giving 11 feet 3 inches, and it has already proved a great attraction, the attendance having increased considerably since it has been on view. Both these elephants were obtained by Englishmen expressly for museum purposes. With regard to the question of height it may be noted that both exceed that of the famous Jumbo, and probably approach

the maximum limits. A famous hunter expressed his disbelief in twelve-foot elephants, and he claimed to know more about the subject that those who maintained that such a measurement had been reached. In the character of the ears, which Mr. Lydekker recently made the criterion for distinguishing the different races of the African elephant, the Edinburgh specimen, obtained by Major Powell-Cotton in the Lado enclave, approaches one shot near Lake Rudolf by Mr. Cavendish, and named in his honor. Of quite a different type is the Orleans elephant of North Somaliland, with a lobe or lappet at the lower part of the ear. The head of the type-specimen adorns the walls of the Duke of Orleans's private museum at Wood Norton, the whole of which was arranged by Rowland Ward, who also mounted the trophies, the groups being set up from the duke's notes, photographs and sketches, under the royal owner's personal direction.

UNIVERSITY AND EDUCATIONAL NEWS

Bowdoin College has received a gift of $50,000 from Mr. Andrew Carnegie, to endow a chair of physical science, history and political science in memory of the late Thomas B. Reed. The college has now received $150,000 of the $200,000 required by the General Education Board to make available its gift of $50,000.

Professor Thomas Barker, from 1865 to 1885 professor of mathematics at Owen's College, now Victoria University, Manchester, who died on November 20, has bequeathed most of his estate to the university to establish a professorship of cryptogamic botany and to found scholarships in mathematics and botany. The bequest will amount to about $200,000. Professor Barker also left his microscopes, apparatus, botanical books and herbarium, and his mathematical and general scientific books to the university.

By the will of the late Mrs. Annie E. Fulton, the University College of South Wales and Monmouthshire receives a bequest amounting to about $45,000.

The Educational Times states that Macdonald College, Quebec, established and endowed by Sir William Macdonald, of Montreal, was opened to students on November 7. The college property comprises 561 acres, and has been divided into the campus of 74 acres, where the buildings are located, with demonstration plots for grasses and flowers; a farm of 100 acres for horticulture and poultry keeping; and a live stock and grain farm of 387 acres. The buildings have been planned in accordance with the most modern scientific principles. The cost of the buildings and equipment exceeds £300,000, and in addition Sir William Macdonald has provided a permanent endowment of £400,000. The college is incorporated with McGill University, and Dr. James W. Robertson, C.M.G., is the principal. The college includes a school for teachers, a school of household science, and a school of agriculture. Tuition is free to residents in the Province of Quebec.

The daily press states that Professor Albert Ross Hill, of Cornell University, formerly dean of the Teachers College of the University of Missouri, is soon to succeed Dr. Richard H. Jesse as president of the university.

At the Pennsylvania State College, Professor J. P. Jackson has been appointed dean of the School of Engineering, and Professor Hugo Diemer, dean of the mechanical department.

Mr. W. Bateson, F.R.S., fellow of St. John's College, Cambridge, since 1885, who recently came to this country to give the Silliman lectures at Yale University and to attend the meeting of the International Zoological Congress, has been appointed reader in zoology at Cambridge University.

Dr. J. G. Frazer, of Trinity College, Cambridge, has accepted the new chair of social anthropology in the University of Liverpool.

Correction: In Mr. Bateson's address, Science, November 15, 1907, p. 655, col. 1, par. 4, for 41:7:7:9 read 177:15:15:49.

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